J. H. VAN DEVENTER
President and Editorial Director

C. S. BAUR
Vice-President & General Manager

o o o

Editorial and Advertising Offices
100 East 42nd St., New York 17, N.Y., U.S.A.

O. L. Johnson, Market Research Mgr.
B. H. Hayes, Production Manager.
R. E. Baur, Typography and Layout.

o o o

Regional Business Managers
C. H. OBER, New York 17, 100 East 42nd St.
H. E. LEONARD, New York 17, 100 East 42nd St.
ROBERT F. BLAIR, Cleveland 14, 1016 Guardian Bldg.
W. J. FITZGERALD, Pittsburgh 22, 428 Park Bldg.
B. L. HERMAN, Philadelphia 39, Chilton Bldg.
H. K. HOTTENSTEIN, Chicago 3, 1134 Otis Bldg.
PEIRCE LEWIS, Detroit 2, 7310 Woodward Ave.
D. C. WARREN, Hartford 1, Conn., P. O. Box 81
R. RAYMOND KAY, Los Angeles 28, 2420 Cheremoya Ave.

o o o

Owned and Published by
CHILTON COMPANY
(Incorporated)

Executive Offices
Chestnut and 56th Sts.
Philadelphia 39, Pa., U.S.A.

OFFICERS AND DIRECTORS

C. A. MUSSELMAN, *President*
JOS. S. HILDRETH, Vice-President
GEORGE H. GRIFFITHS, Vice-President
EVERIT B. TERHUNE, Vice-President
J. H. VAN DEVENTER, Vice-President
C. S. BAUR, Vice-President
WILLIAM A. BARBER, Treasurer
JOHN BLAIR MOFFETT, Secretary
JULIAN CHASE, THOMAS L. KANE
G. C. BUZBY, P. M. FAHRENDORF
HARRY V. DUFFY, CHARLES J. HEALE

o o o

Member, Audit Bureau of Circulations

Member, Associated Business Papers

o o o

Indexed in the Industrial Arts Index. Published every Thursday. Subscription Price North America, South America and U. S. Possessions, $8; Foreign, $15 a year. Single Copy, 35 cents.

o o o

Cable Address, "Ironage N. Y."

o o o

This Week in The IRON AGE

Vol. 153, No. 18 May 4, 1944

Editorial

o o o

Technical Articles

o o o

Features

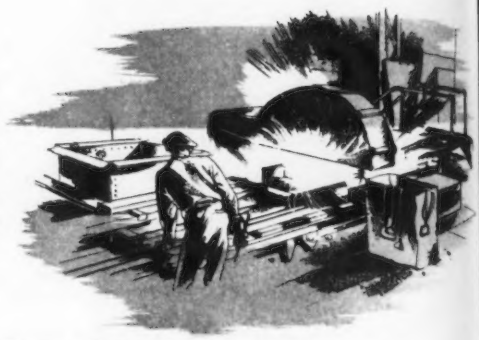
o o o

News and Markets

o o o

Can These Ryerson Skills Help You?

Steel Cut to Close Tolerance. Experienced crews working with modern high-speed friction saws, giant shears, powerful hack saws and other metal-working machinery can turn out steel quickly—cut, formed or otherwise prepared to your requirements. Steel that is cut to exact size and specification eliminates scrap and frees your man-hours for more production.



Any Shape Expertly Flame Cut. Skilled operators and modern equipment—combined with ever-present stocks of all types of steel—assure quick, accurate flame cutting and prompt delivery. Almost any shape, no matter how intricate, can be fashioned from steel plates or shapes. You save the time and expense of forging or casting and gain the added strength of rolled steel. Complete welded and riveted assemblies are also fabricated by Ryerson.

Metallurgical Help For Steel Problems. Our staff of engineers and metallurgists are experienced in serving customers in every branch of industry. These men have displayed a genius for solving problems pertaining to steel application, heat treating and fabrication. Theirs is the practical type of *know-how* and you can depend on them to work with you whenever a difficulty arises.

Speedy Delivery Without An Expediter. Every man and woman in our eleven strategically-located plants knows the meaning of the word *rush!* The Ryerson organization is geared to getting your steel delivered in the shortest possible time. Write for your copy of the Ryerson Stock List—complete catalog of steels in stock for immediate shipment including: bars, shapes, plates, sheets, structurals, tubing, carbon and alloy steel, tool steel, Allegheny Stainless and many others.

JOSEPH T. RYERSON & SON, INC., STEEL-SERVICE PLANTS AT: CHICAGO, MILWAUKEE, ST. LOUIS, CINCINNATI, DETROIT, CLEVELAND, PITTSBURGH, PHILADELPHIA, BUFFALO, BOSTON, JERSEY CITY.

RYERSON

The
IRON AGE

ESTABLISHED 1855

o o o

May 4, 1944

o o o

J. H. VAN DEVENTER
President and Editorial Director

C. S. BAUR
Vice-President and General Manager

o o o

A. H. DIX
Manager, Reader Service

o o o

Editorial Staff

Editor.....T. W. LIPPERT
News, Markets Editor...D. R. JAMES
Technical Editor.....F. J. OLIVER

o o o

Associate Editors
F. J. WINTERS
T. E. LLOYD
S. H. BARMASEL

Editorial Assistants
M. M. SCHIEN
G. B. WILLIAMS
G. P. BUTTERS

Regional News and Technical Editors
T. C. CAMPBELL
Pittsburgh 22
428 Park Bldg.

C. T. POST
Chicago 3
1134 Otis Bldg.

L. W. MOFFETT
DONALD BROWNE
EUGENE HARDY
Washington 4
National Press Bldg.

D. C. MacDONALD
Cleveland 14
1016 Guardian Bldg.

S. H. BRAMS
Detroit 2
7310 Woodward Ave.

OSGOOD MURDOCK
San Francisco 3
1355 Market St.

Editorial Correspondents
ROBERT McINTOSH
Cincinnati

C. M. PENLEY
Buffalo

G. FRAZAR
Boston

HUGH SHARP
Milwaukee

F. SANDERSON
Toronto, Ont.

R. RAYMOND KAY
Los Angeles

JOHN C. McCUNE
Birmingham

ROY M. EDMONDS
St. Louis

IAMES DOUGLAS
Seattle

Little Mistakes Become Big Blunders

INDIVIDUALS and institutions alike are "typed" in the public mind more by little things than by big ones. A salesman who comes into your office chewing gum and a telephone operator or receptionist who is either impudent or high hat are "typed" at the outset by those who meet them.

Some people might say that these things are picayune and should not influence opinion in broad minded circles. But they are not picayune. The gum chewing salesman reflects the ineptitude of the sales manager who hires him and of the company who employs such management. And the impudent or incapable subordinate who is the company's first point of contact, types the organization, from president down, in the minds of those exposed to him.

There is long tradition and good authority back of this habit of judging by little things. It goes back to the Biblical advice that: "By their works ye shall know them." Notice that this injunction mentioned "works" not theories, promises or protestations.

I have mentioned before on this page, the fact that the American public had been given the "works" in the form of the atrocious Lincoln penny. Why this amateurish and confusing product of thoughtlessness and ineptitude should be named after one of our clearest thinking presidents is beyond imagination.

Just within the last few days, I have received from the Stanley Steel Co., Ltd., a sample of the new Canadian cold rolled steel nickel. It shows what can be done by an administration that looks before it leaps when faced with the problem of substituting one coinage metal for another. No one could possibly confuse this new Canadian coin with any other denomination of the Dominion. It is both practical and attractive.

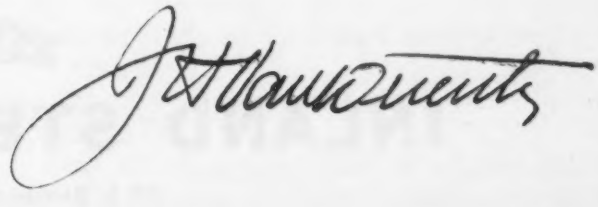
Not content to learn by their mistakes, our New Dealers have perpetrated another colossal blunder. I refer to the new blue and red ration tokens.

In the two months which have elapsed since these tokens were introduced, more than 12,000 of them have been put into the slots of transit company fare boxes, according to the American Transit Association. They have also been found in cigarette and candy vending machines, postage stamp dispensers and even in automatic War Savings Stamp vending machines.

At the date of issue of the statement, last week, this practice had already cost transit companies alone something like $30,000.

We have to be fair in these matters and perhaps the public has been at last given a break. After shrinking the value of the dollar to 59 cents, our New Dealers have now given the public a chance to get even by passing pennies for dimes and fiber tiddle-dy-winks tokens for transportation fares.

A little mistake of course is excusable. But when it is multiplied as these are by hundreds of millions, you arrive at a big blunder.



Spheroid Floats—

Another Wartime Use of Inland Steel

Guarding America's great harbors is a small Navy within the Navy—the men and tenders who handle the antisubmarine and antitorpedo nets. These nets, often more than two miles long, are supported by spheroid floats. A great number of these floats, which are 58 in. in diameter, are made by welding together preformed segments that are cut from Inland plates.

The plates shipped for this purpose by Inland not only measure up to specifications, but they are delivered on schedule, assuring uninterrupted production, low manufacturing cost, and on-time delivery of floats to the Army and the Navy. Meeting customers' manufacturing schedules is an Inland tradition, which we have done our best to maintain even in the face of the heavy demands and changing needs of wartime production. This principle of punctuality begins when an order is taken—and follows through the order department, the metallurgical department, Inland's modern mills, and the traffic department. To Inland, every order calls not only for high uniform quality but for cooperative service as well.

When you need steel we invite you to call Inland.

Sheets • Strip • Tin Plate • Bars • Plates • Floor Plate • Structurals • Piling • Rails • Track Accessories • Reinforcing Bars

INLAND STEEL COMPANY

38 S. Dearborn St., Chicago 3, Ill.

Sales Offices: Cincinnati • Detroit • Kansas City • Milwaukee • New York • St. Louis • St. Paul

The IRON AGE
MAY 4, 1944

NEWS FRONT

► Germany has always favored the liquid cooled in-line motor for military aircraft. A year ago, however, the new Folke-Wulf came out with a radial air-cooled motor, a very conspicuous and unique feature of which was a power driven fan to improve cooling. Now, one of the largest makers of American air-cooled motors has announced a new motor with an integral driven fan, and: the French Gnome-Rhone concern has announced a four row, radial air-cooled engine of 3700 hp. This motor also will use the fan assisted cooling, patterned after that employed by the German BMW 801.

► Many American military aircraft motors will soon carry water injection equipment whereby water can be squirted into the cylinder to give 50 per cent or more increase in engine power for short spurts of time, when the pilot is in serious difficulty.

► Reversing the trend toward heavier and higher powered fighter aircraft, designers are showing interest in very light-weight and small fighter planes, made perhaps of plywood and carrying an air-cooled in-line (Franklin) motor of a power under 1000 hp.

► Regardless of the actual supply picture, West Coast allocations appear to be as firmly entrenched as ever.

A sore point in the material allocations situation is iron and steel scrap which continues under allocation while there exists in this area no apparent scarcity.

► The West Coast chemical industry appears to be a postwar money maker as evidenced by the recent purchases by du Pont of the Latimer-Goodwin Chemical Co. plant at Tacoma and by Monsanto Chemical Co. of I. F. Laucks, Inc., at Seattle.

► Shot in the arm for the machine tool industry are the Army programs for heavy artillery and shells, truck axles, changes in aircraft and new landing craft. These programs all require new machine tools quickly and the Army appears to be poised to release up to three-quarters of a billion dollars worth of new machine tool orders for 1944 delivery.

► To reduce financial risks, the steel industry sees a need for legislation or regulations permitting payment for raw materials, including ores in the process of reduction and metal in process of being rolled. Present termination regulations are silent on the subject.

► Beer is carried into the Pacific fighting front by fighter plane belly (gas) tank. It's nice and cold when the plane lands.

Glenn L. Martin says, in private conversation, that the postwar transportation of food will employ huge cargo planes flying in the substratosphere. Hull openings will result in freezing of the cargo in transit, resulting in economies in time and money.

► At the request of the late Secretary of the Navy Knox, General Motors Corp. and U. S. Steel officials will assist the Navy in making a study designed to improve its methods of handling materials and supplies.

► Through a Mexican corporation now being formed, Continental Can Co., Inc., will build a modern can manufacturing plant in Mexico.

► In the six months since its previous audit, the United Steel Workers of America has gained more than 200,000 members and increased its net worth by $766,844 to $3,313,077.

► Dropping of streamers of tin foil by German aircraft over England has received several newspaper notices. The method was originally devised by the British and is used constantly by them. The function of the tin foil is to give a large radar reading, indicating many more planes at a particular point than actually are there. This accounts for the uncertainty regarding the numbers involved in recent German raids on England.

► Negotiations are reported underway whereby one or two open hearth men from Fontana may be sent to Caracas, Venezuela, to supply technical information and advice on operation problems on a small open hearth furnace there.

► A proposal to make a free port of the Kaiser Liberty-Victory shipyards at Richmond, Cal., is being bandied as a postwar possibility.

► Catapult armed merchantmen are to disappear from the merchant fleets of the United Nations, as there are now enough escort carriers to give the convoys fully protective air cover.

Competitive Characteristics

By JOHN PUTCHINSKI
Centrifugal Casting Department
Allis-Chalmers Mfg. Co.,
Milwaukee

o o o

CENTRIFUGAL casting was utilized originally as a method for making simple pipes. Progress in technique and changes in demand have since made possible the production of complicated shapes and multiple castings.

Generally, castings made *centrifugally*, as differentiated from those made by the *centrifuged* method, should be diametrically balanced about the axis of rotation. So long as the central hole is on the axis of rotation and symmetrical to the bore the castings may include some irregularities such as outside slots, flanges and projections. Most types of tubes and circular castings lend themselves readily to this process, whereas, pieces having extended offsets must be counterbalanced by weights. In *centrifugally* casting these types, an ideal condition exists when solidification progresses from the outer to the inner wall of the casting. This results in a product with a definite outline and sharp detail not restricted by the pads or fillets of the static process.

o o o

FIG. 1—Centrifuged castings. The casting at left is of gray iron. The 85-5-5-5 alloy at right had the sprue poured statically and was then spun; note complicated vancing.

For other articles on centrifugal casting, see THE IRON AGE *issues of April 1 and 22, May 13 and 20, and Dec. 2, 1943; also, March 30, 1944.*

Two considerations determine the initial manufacture of metal parts—the quality required and the cost of manufacture. Still another feature—availability—presents itself, and currently it is particularly important.

The chief concern of this article is to outline the factors which determine the cost of manufacture or the comparative costs as related to the process of completing a part or casting from the raw material.

The basic limitations of the process cannot be well defined, since, with enough expenditure, equipment and research work it may be possible to spin any castings by a method that could be called *centrifugal*. However, until some such experimental work is done, the following limitations are realized.

Materials should be suitable for the process. Most metals such as pure copper, copper-nickel alloys, aluminum and manganese bronzes, a variety of copper-tin-lead-zinc alloys, cast iron and steel are practical with some few exceptions in the ferrous and non ferrous groups. Among these restrictions in the non-ferrous groups are high-phosphorus alloys which wet the mold and stick badly; high leaded alloys containing 20 per cent or over which tend to "centrifuge" alloys which are not suitable to the application without further heat-treatment (cast iron in permanent molds); alloys which are hot-short and may possibly crack at high speeds (thin walled sections of silicon bronze which need extraordinary control of temperature and metal handling.)

However, with good judgment and experience, most of the alloys can be handled favorably. In fact, metals lacking in ductility or malleability which cannot be extruded or rolled, may successfully be cast *centrifugally*. Among these are high antimony, high bismuth and high tin alloys.

Due to *centrifugal force*, combinations of metals may be realized. In some instances a composite of gray iron and brass has been made, and, in the ferrous field, a high-chrome steel ring is cast with a lower grade backing. With progressive design improvement of placing wear resisting material where its quality is required, extensive developments are anticipated.

Suitability as to size and shape is another consideration in *centrifugal* casting. Size as a single consideration is principally determined by the speed-range, strength and construction of the mechanical equipment available. Parts weighing from three-quarters of a pound to several tons have been cast successfully and economically.

In considering the economy of the process we also set a bottom limit in size. At present in *centrifugal* casting some difficulties are still experienced where "cast to size" or "no machining" are specified, particularly on plate castings of thin sections and very large diameter. It is not practical to make an ordinary plate or a simple cover by casting it *centrifugally*, simply for appearance sake. For unless exacting conditions are maintained, a good appearance will not result.

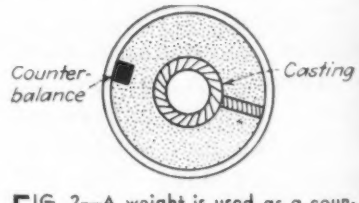


FIG. 2—A weight is used as a counterbalance when the casting has some irregularity.

Shape is a factor of prime impor-

# of Centrifugal Castings . . .

. . . What metals and what products can be cast centrifugally or centrifuged? What are the factors which determine the cost of manufacture centrifugally or by other methods? These are the questions dealt with herein.

o o o

tance. Though its definition may vary considerably, it should contain certain basic features for the most desirable usage. Continuity of adjacent parts is the basic element. *Centrifugal* force lessens the difficulty of filling heavy sections through a thin wall.

Symmetry is necessary because of the excessive stresses produced when an unbalanced load is swung about the machine axis. The stress is proportional to the load and the square of the speed. Preferably, the casting should be diametrically balanced about the axis of rotation, or should some irregularities become evident a weight is used to counterbalance this effect (Fig. 2).

Non-cylindrical or slotted bores in uncored openings have not, as yet, been successful in *centrifugal* castings. These are represented in Fig. 3.

Pressures developed in the mold extremities by *centrifugal* force prescribe come limitations as to true or cylindrical bores. For example, imagine casting a propeller blade with its hub. A certain speed would be calculated for the bore to avoid the parabola formation; then the force on the end of the blade would go beyond the limits of the machine (Fig. 4).

Minimum size of the spun holes is another important feature. Bores below 1 in. have not been very practical. Excessive losses are realized in the handling of the metal, through spillage (in the flush out method where excess metal is emitted through the cover for cast size and is nearly

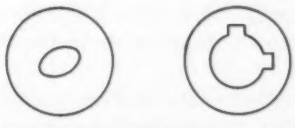


FIG. 3—Non-cylindrical or slotted bores in uncored openings have not, as yet, been successful in centrifugal castings.

completely oxidized), or, in the length of time the metal is held in the furnace. A probable solution to this problem is to spin the castings solid. If practical, several pieces should be placed about the axis of rotation with a central gate. Where quality and its linking features are unnecessary, it may be better to cast these small jobs statically.

Ring blanks having heavy cross-sectional area tend to shrink in the center of the inside bore. This is particularly true on individual pieces of large diameter with small heights. In order to overcome this natural shrinkage, it becomes necessary to add large amounts of stock in the bore to insure a sound, clean casting (Fig. 5); or, the metal pouring must be started rapidly, then tapered off.

Castings with a vertical bore and outlying details at right angles have definite limitations in the non-ferrous fields because of dross entrapment (Fig. 6). This difficulty of trapping in corner sections is minimized in steel castings where the metal is not so rapidly disturbed by oxygen. A possible procedure for overcoming this defect is to inject neutral gases inside the mold previous to the introduction of the live metal.

The shrinkage of metals from the mold wall aids the extraction of castings and the repetition of the casting process. After one casting is spun it is but a matter of seconds before the mold can be adjusted and prepared for the next casting.

Still other restrictions are noticed in the use of cores. Hard surfaces, high tensile strengths and high dry strengths are required for the outside or cover cores. Cored center openings present production problems. The difficulty exists chiefly in anchoring the core in a permanent or semi-permanent mold. Cores, colloquially termed, "splash cores", have proved successful.

Where cored openings are necessary as reliefs in permanent mold equipment, or to gain inside contours, collapsible center cores must be used due to the contraction. This is necessary, in casting a pulley for example, where the outside rim may be level or higher than the hub. The metal casting will crack (Fig. 7) if it is not able to collapse the materials between its constricting areas. Special care must also be taken in tying these cores.

Where it is necessary to insert pin cores in the area of the surface for bored holes (Fig. 8) it is preferable to use the *centrifuged* method or static casting. If the metal is poured while the mold is rotating, the metal washing these pin cores invariably will wash the core away or show flow lines detrimental to the casting.

Another limitation characteristic of *centrifugal* casting is the requirement that the cored or cast hole must be near the axis of rotation to insure progressive shrinkage and proper feeding by use of centrifugal force.

Previously, machine design has been characterized by heavy construction. This was necessary because of failure to obtain maximum physical properties in casting. Generally, the process of streamlining equipment and making it more compact has increased the demands for an improved smaller type casting—one which occupies a minimum of space with a maximum efficiency. Where metal density and

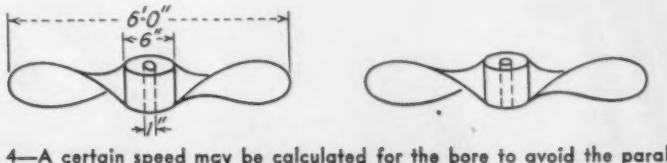


FIG. 4—A certain speed may be calculated for the bore to avoid the parabola formation (right), and at this speed the force on the outer end of the blade may go beyond the limits of the machine.

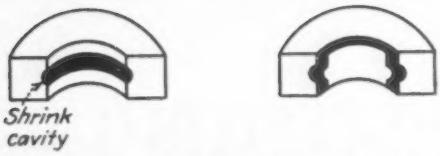


FIG. 5—Ring blanks having heavy cross-sectional area tend to shrink in the center of the inside bore. It may be necessary to add large amounts of stock to the bore (shaded area, right) to insure a sound, clean casting.

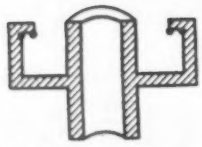


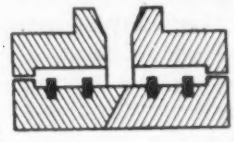
FIG. 6—Castings with a vertical bore and outlying details at right-angles have definite limitations in the non-ferrous fields because of dross entrapment (dark areas).

FIG. 7—Where cored openings are necessary as reliefs in permanent mold equipment, or to gain inside contours, collapsible center cores must be used due to the contraction, or the metal will crack (wavy lines).

o o o

RIGHT

FIG. 8—Where it is necessary to insert pin cores in the area of the surface for bored holes, it is preferable to use the centrifuged method or static pouring. Top view of casting at left; side view at right shows position of pin cores.



• Pin cores
—Flow lines

compactness of size are required qualities, *centrifugal* casting may be the only solution for some engineering problems and the comparative costs may not be a factor.

Parts that have been cast successfully are legion. In gray iron: a variety of gear blanks, pulleys, stick castings, sleeves and bushings. In non-ferrous metals: blanks and bushings of all sorts, squares, hexagon and octagon shapes and many types of sleeves capable of withstanding hydraulic pressures as high as 3000 lb. per sq. in. (Fig. 9 shows some variety among the smaller types; much larger types based on the same principle have been made.)

In steel: cluster gears, gear blanks, valve bodies, inside flanges, airplane landing gear parts and axles are common castings. Steel lends itself more readily to *centrifuged* castings than do the non-ferrous alloys because of the easy removal of the gates with a cutting torch.

Due to its directional qualities, *centrifugal* casting challenges forging in some fields. The resultant castings are uniform, closer to size, compare favorably in density with a high percentage of yield in the casting and machining operations. In many instances the casting has only a boring or threading operation and can then be immediately applied to the job; whereas in comparative instances of free forgings the latter may have to be trued, then milled, turned, bored and threaded. Frequently such forgings require more expensive equipment, more machining and more highly trained mechanics. (Fig. 10.)

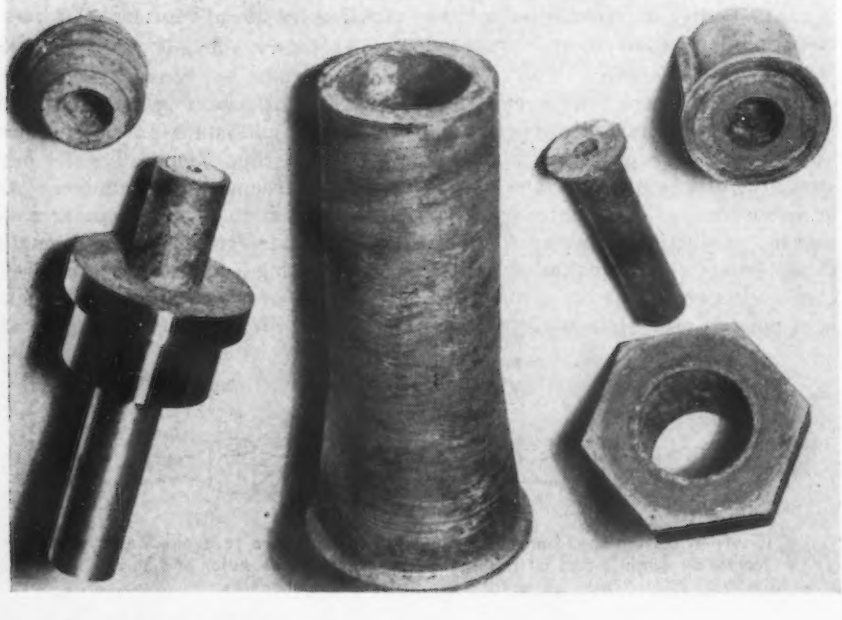
Price is a much debated question. Static casting with its "gang" molds offers competition in certain types of small, individual pieces or jobbing lots. Often arising is this question—is it more economical to spin 12 individual pieces with no further operations necessary before machining, or is it cheaper to make 12 in a single flask, considering the cost of such additional operations as cutting off gates, handling the sand, as well as extra equipment repair and other necessary overhead? It is understood, of course, that no special physical characteristics of high tensile strength or density are required.

The cost of molds or mold material is not much different than the cost of good sand pattern equipment. The use of permanent and semi-permanent molds for bushings minimizes cleaning costs, eliminates the center core and reduces extra metal handling. *Centrifugal* casting, due to its higher yield and lower scrap percentage proves more favorable in the non-ferrous field because there is a comparatively lower overhead through lack of risers and accompanying costs. A higher yield results, not because of personnel but because of better metal pressure and control through feeding that cannot be accomplished in static casting. The higher yield is the outstanding feature in the foundry or in the machine shop.

Another consideration can be recognized in the machining costs. A *centrifugal* casting, if it is to be scrapped at all, would be found defective in the first machining or roughing operations; gas holes or spongy structures are readily noticed. On the other hand, this does not hold true for a static casting, where inherent defects may still exist.

For example, in static casting a heavy bushing, a shrink or gas hole may be confined some place within the wall and not be uncovered in the ma-

FIG. 9—A variety of centrifugal castings.



chining. This job may be sent into the field for use and placed under pressure, with a resultant leakage. But after the final machining of a *centrifugal* casting, the part may be sent out on the job with a good assurance of its soundness and performance.

A comparative cost can be seen with the layout of all the predominant managerial factors arranged as in a balance sheet. In comparison we find only small space necessary for *centrifugal* casting with a large building for static or sand casting; less skilled and highly trained personnel is needed; for *centrifugal* casting somewhat more equipment is necessary, but the higher initial cost is compensated by the higher yield, with a variable metal loss through oxidation and holding in a furnace that favors the larger *centrifugal* casting; production per man is reasonably higher than that of static casting.

Altogether, though, the initial cost of *centrifugal* casting may be higher on complicated jobs which may require cores or special mold equipment.

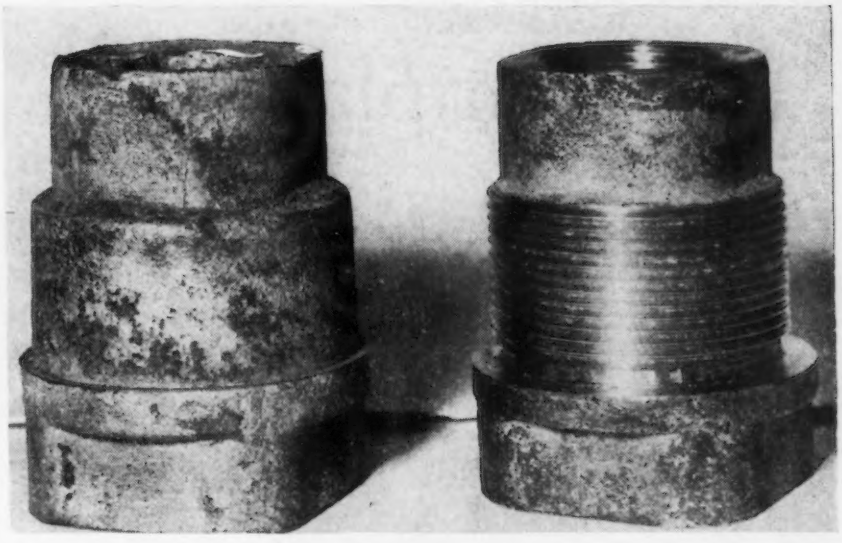


FIG. 10—This centrifugal casting is shown as cast (left) and machined ready for application (right).

The finished cost will usually be similar to or less than a static casting. Therefore, *centrifugal* casting should be considered even in the less obvious cases. With these principles in mind, it can be concluded that a *centrifugal* casting is desirable because of the following advantages:

(1) High quality of the casting.
(2) Greater yield.
(3) Savings in machining costs.
(4) Limited equipment needed.
(5) Maximum production with limited space.

Self-Limiting Hoist Drive Developed

A NEW electric hoist drive for cranes, the important feature of which is an exciter embodying a cross-flux principle, was described in a paper presented by M. A. Whiting of the General Electric Co. at a recent meeting of the American Institute of Electrical Engineers. The new drive system not only automatically "weighs" the load so that it is hoisted and lowered at the maximum safe speed, but also prevents the handling of dangerous overloads. This is accomplished without the use of mechanical relays or similar devices.

Although the first successful application has been to two high speed, high lift cranes at the TVA Fontana dam, in North Carolina, which place concrete at the rate of almost 8 tons a min. Mr. Whiting pointed out that the drive is believed to be equally suitable for application to high grade, heavy duty indoor cranes in steel mills and heavy machine shops.

The equipment consists of a generator, a cross-flux exciter and an ordinary constant-voltage exciter driven by an induction motor, or if preferred, by a synchronous or a d.c. motor. The hoist motor is of the type which is standard for high speed crane hoist installations, except that it has a nonstandard main field for a variable separate excitation. The cross-flux exciter is designed and connected to the system so that an increase in load on the hoist, either motoring as in hoisting, or regenerative as in lowering, reacts on the field of the exciter, causing it to strengthen the hoist motor field and simultaneously weaken the generator field an amount depending on the magnitude of the load.

Since the generator supplies the power to the hoist motor armature, weakening the generator field reduces the voltage impressed on the hoist motor armature and reduces its speed. Also, strengthening the hoist motor field reduces the motor speed. In addition, strengthening the motor field corrects the ill effect of armature reaction and prevents any trend toward instability. A decrease in hoist motor load, either hoisting or lowering, has the opposite effect, thereby increasing the speed of the hoist motor. In this case, however, there is no neccssity for armature reaction correction since the decreasing load automatically reduces its effect.

This effect from the cross-flux exciter, Mr. Whiting explained, is partly brought about by energizing one of its fields by series turns through which the current in the hoist motor armature flows. Since this current flows in the same direction whether motoring or regenerating, the effect on the hoist motor field and the generator field is the same in both cases. The method of interconnecting the motor field, the generator and the cross-flux exciter armature is also important in producing these effects.

Template Reproduction Methods

By THOMAS MILES
Template Reproduction Engineer, Consolidated Vultee Aircraft Corp.

. . . Numerous methods of transferring engineering information onto tooling and fabrication materials are being used by aircraft manufacturers, and since no two companies have precisely the same requirements many plants have developed new techniques by altering their photographic equipment. The author reviews the various methods now in use and makes recommendations based upon the ability of any process to fulfill a particular requirement.

ONE of the first considerations in discussing any method of template or parts reproduction is its adaptation to an existing system of design and fabrication. Some companies have revised their customary systems around the advantages offered by a particular method of reproduction. Others have found that they benefit more by introducing a new method for shop use only, such as duplication of existing templates, etc. For the purpose of comparison, template reproduction may be classified into three groups:

A Projection methods using photographic materials
B Contact methods using photographic materials
C Contact methods using lithographic or chemical means of transfer.

In discussing the various methods of reproduction, it is necessary to evaluate properly the advantages offered by each. The most effective way to determine the value of any particular process is to attack the problem from the standpoint of ability to perform the greatest number of services to expedite the entire handling of a part.

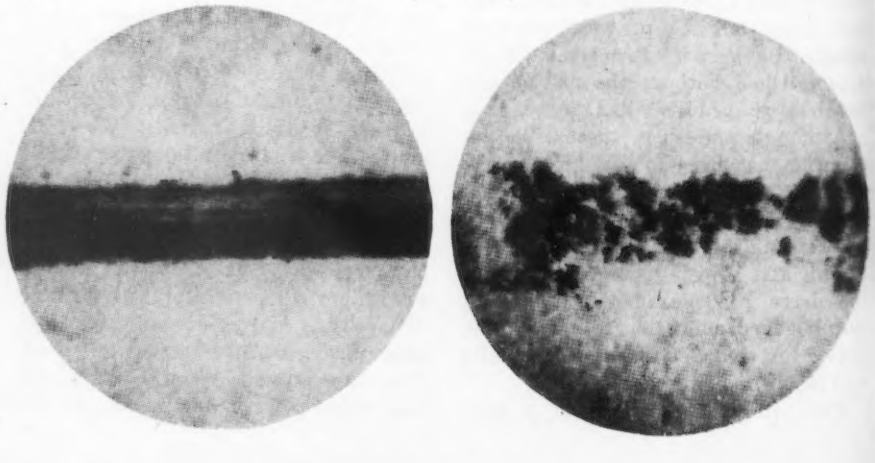
Projection Methods

The projection method in general makes use of the standard copy technique long used by photographers for making duplicates, with refinements dictated by the need for accuracy, the handling of very large sheets, and the reproduction onto metal instead of the conventional printing-out paper. The master layout is prepared on a sheet of aluminum or steel of about 0.051 or 0.064 in. in thickness which has been sprayed with several coats of fine grained matte lacquer.

The lines are put on with a 4H or 5H pencil sharpened to a chisel point. The width of the line is largely dependent on the condition of the chisel point of the pencil. In all reproduction work it is very important to have a clean dense line; the quality of the final prints depends on the uniformity of coverage of the graphite over the area defined by the edges of the line. Fig. 1 illustrates the difference.

The camera is set up and calibrated to a standard set of size reductions, usually either one-quarter or one-fifth. The master layout is placed on a vacuum-frame easel which holds the layout firmly in the flat plane of the easel face. A sensitized glass plate is placed in the negative holder, the master layout is then illuminated, and the plate exposed. The plate is then developed in an extreme contrast developer, fixed in an acid fixing bath, washed thoroughly and dried. This negative is retouched with an opaque to block out unwanted details, and is then put back into the holder for projection to a positive reproduction of the original master layout. This is done by blacking out the easel side of the camera, replacing the master layout with a sheet of photographically sensitized metal, moving up the lamphouse behind the negative, turning on the light source and making the exposure as before. The latent image on the sensitized sheet is then developed and fixed, washed and dried,

FIG. 1—Clean dense lines are important in making good reproductions. The best lines are made with 4H or 5H pencil sharpened to a chisel point.



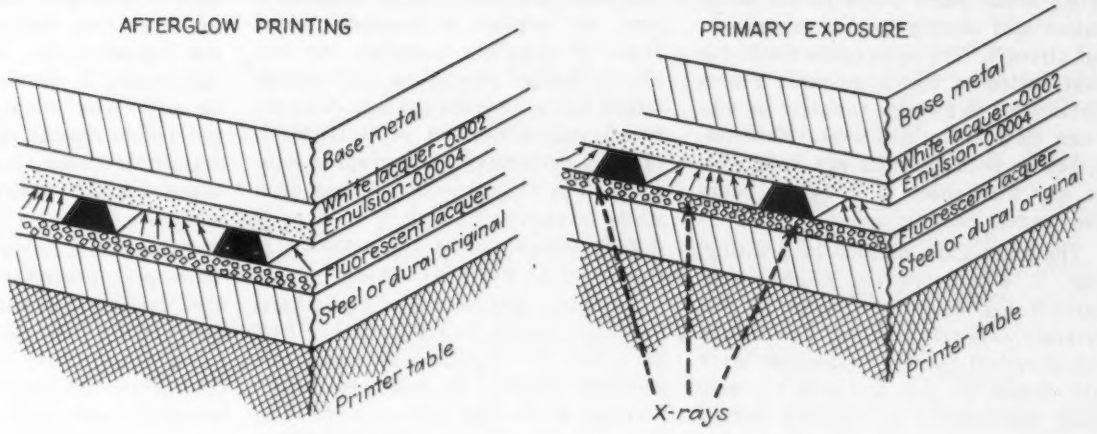


FIG. 2—Cross-sections of an "afterglow" reproduction and a "primary exposure," both produced by X-ray activation of fluorescent lacquer.

and the reproduction is checked for any distortional effects.

The projection method lends itself nicely to such things as making reduced scale transparencies to cut down sizes of blueprints made from the master layouts, making reduced scale templates for wind tunnel models or other testing purposes and making increased scale templates or shrink templates for alloy dies. Right hand templates may be made by reversing the negative, provided the negative is made on a superior grade of plate glass free from irregularities. An entire contour may be developed from either half by matching the right and left hand images on a single print.

It is not practical to attempt the quantity reproduction of lines on a variety of materials having different thicknesses by the projection method. This is particularly so when many different thicknesses are to be printed from a single negative, since the precision changing of the easel requires considerable time that might be spent in making templates of these areas on a standard gage of template stock.

One objection that has been raised in connection with the projection method has been the tendency for lines to widen when printed upon a sensitized surface backed up with a white lacquer. This is because the halation or light that has passed through the emulsion and is reflected back from a white surface tends to spread and expose a larger area than it covers upon incidence with the emulsion surface. The use of tinted base lacquers and shorter exposures will remedy this difficulty. The glass negatives used are very permanent to all effects except violent or careless handling.

X-Ray Methods

To preclude many of the obvious dimensional and operational difficulties found in projection methods two processes known as the X-ray template reproduction methods are used. One of these uses a fluorescent lacquered sheet activated by X-rays to expose a photographically sensitized sheet, and is known as the "primary exposure" method. The other uses the phosphorescent residue succeeding X-ray activation to fluorescence to expose the sensitized material and is known as the "after-glow" method. The two methods (Fig. 2) each have their specific applications. The primary exposure method is best suited to reproduction of the many rela-

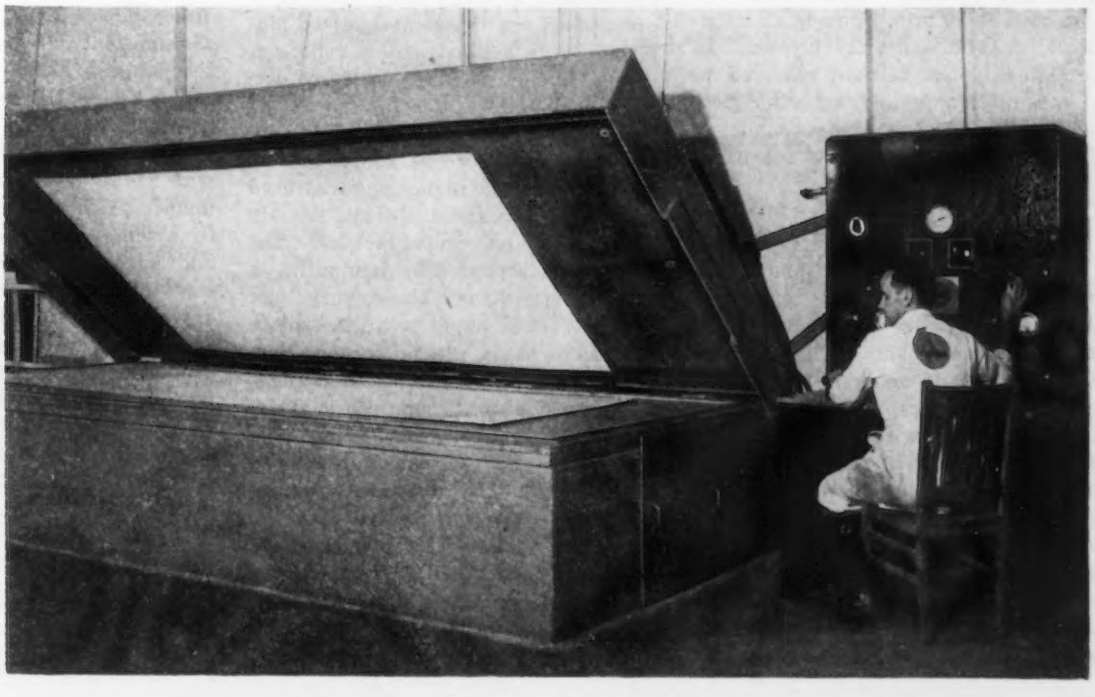


FIG. 3—Making a metal negative by the "after-glow" method. The template is first activated by exposure to X-rays and then a metal negative is made merely by bringing the sensitized sheet in contact with the activated layout in the printer shown. Positive template reproductions from the negative are made by X-ray exposures.

tively small parts found in the fabrication and tooling for an experimental aircraft. The after-glow method is best suited to the large scale reproduction of drawings ranging in size from 48 x 72 in. and over. However, either or both methods are applicable to any size sheet, 7 x 14 ft. being the largest now in use.

The after-glow method of printing, Fig. 3, eliminates the slight background fog on prints made by the primary exposure method. The X-rays not absorbed by the fluorescent layer will expose the film and give a pearly gray background to positive prints, particularly those given prolonged X-radiation. Since the activation exposure to X-rays of the layout is much longer for after-glow than primary exposures, it is necessary to use an X-ray unit of higher energy output and mount it overhead in a lead lined chamber. The layouts are placed on the copy carriage and rolled into the chamber. The 200 to 250 kv.-peak X-ray unit is turned on and an activation of 5 to 10 min. is made at a distance of 14 ft. from the layout. The activated layout is then removed to a vacuum frame and an after-glow exposure of 5 to 10 min. made in vacuum contact with the sensitized material.

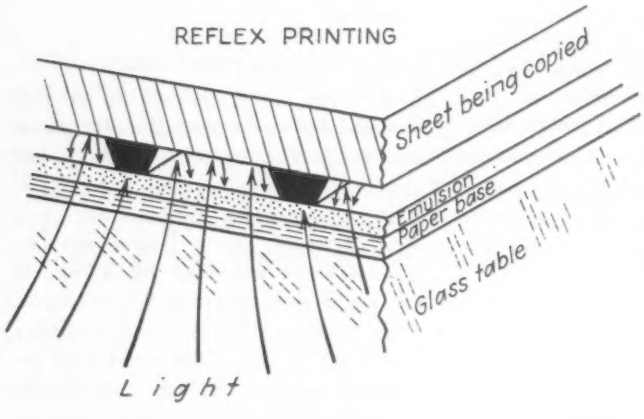


FIG. 4—In reflex printing, when light is reflected from the white areas of the drawing the increased exposure produces a high density. The original pencil lines are made on white lacquer.

Masking Phosphorescent Method

The masking phosphorescent method of reproducing templates, parts, etc., applies to the use of a phosphorescent paint. The original drawing is made on a sheet of metal sprayed with phosphorescent lacquer and overcoated with black masking lacquer. A scribe is used to remove the masking lacquer along the areas to be reproduced, care being taken not to scribe into the phosphorescent layer beneath. When the drawing is complete, the exposed phosphorescent lacquer is uniformly activated with ordinary lighting or fluorescent lamps. The phosphorescence thus obtained is used to expose a photo-sensitized sheet of template material, the two sheets being placed in a vacuum frame to insure good contact. The exposed template sheet is then developed by customary photographic solutions. The print has black lines on a white background, and is read as a mirror image unless the scribing is done also as a mirror image.

To obtain left hand and right hand reproductions or to match either half of a contour together to make one complete contour, the lines are scribed through a masking lacquer applied to thin plastic sheets. Reproductions may then be made in either hand by printing in a glass-topped vacuum frame to a photo-sensitized surface on metal, paper, etc. Transparencies can also be made.

Reflectography

Another method of reproduction comprises making reflex negatives by contact and printing back to a positive on any desired sensitized material. This method, called reflectography, is now in use by many aircraft companies but is limited at the present to a maximum size of 4 x 6 ft. The drawing to be reproduced is made in the same manner as that used for the photographic process, namely pencil lines on white lacquer. The negative is prepared by laminating a sheet of translucent based, very high contrast, reflex paper to a glass plate or in some cases, plastic sheet. When the cement is dry, the sensitized glass, emulsion side up, is put into a glass-topped vacuum printing frame, the drawing to be reproduced is placed face down on the sensitized surface, a vacuum blanket is placed over the sandwich and the lights turned on for a few seconds. The light passes through the emulsion without giving it sufficient exposure to produce a strong latent image but when 75 per cent of it is reflected from the white areas of the drawing and back into the emulsion, the increased exposure will make it developable to a high density. The black pencil lines will not reflect enough of the light to materially increase the exposure already made by the passage of the light. (Fig. 4.)

The process holds lines very nicely with no appreciable widening. Negative prints, right hand, can be made by printing the negative to a positive on another piece of negative stock, and after processing, printing the resultant transparent positive back to a negative, or right hand layout, on any desired material. Working from these two transparent plates it is possible to print an entire contour from either half by placing registration points on the original drawing's center line and matching the two transparent plates by printing one half, locally developing the registration points, matching the second to these points and printing again. The same procedure followed by the projection method in splicing very long images is recommended.

Dry Offset Printing

Perhaps the simplest method of reproducing templates is the dry offset printing method. The only requisite is that the original templates are scribed in a good template lacquer on metal, Masonite or finely sanded wood. The process consists of inking the original template or scribed layout with a relatively fast drying printer's ink and placing the inked template on the bed of a proof-press type machine with a sheet of white lacquered template stock of equal dimensions. A rubber surfaced roll of sufficient circumference to cover the longest sheet normally used is rolled across the inked template and across the white painted template stock. The resultant print is black with white lines but is not a mirror image. Although it is not practical to attempt the various refinements and special applications handled by some of the more elaborate methods, dry offset printing is by far the most efficient and productive method to reproduce from existing cut-out templates or from other scribed lines. The accuracy is entirely dependent on the quality of the roll used and the workmanship of the printing bed.

Electrolytic Reproduction

Another method of transferring lines from scribed sheets employs the electrolytic etching process. The original is a sheet of body steel or gal-

vanized sheet upon which has been sprayed a coating of special insulating template paint. Lines are scribed through the paint to the base metal. The transfer is made to cleaned sheets of body steel, galvanized sheet or aluminum by flooding the scribed surface with a solution of ferrous sulphate, placing the cleaned sheet in contact with it and applying pressure by means of a large press. The press has rubber platens into which are inserted flats of copper to establish electrical contact on each sheet. A total power of about 1 kw. is then applied over about 3 sec. The etched copy is washed, dried and a protective clear lacquer finish applied. Many copies may be made in this way from the same original. The accuracy is high because of metal-to-metal contact. The line quality is sometimes inclined to be poor, especially if the template lacquer chips away or if a small amount of oil or grease gets into a scribed line, thus insulating the two sheets at that point. Mirror image reproductions are the only type available, and the materials upon which reproductions may be made are limited to metallics. This method is best suited to the duplication of existing templates.

Electro-Etching Method

The process of template reproduction is carried one step further by a method of electrolytically cutting out the reproduced template. This eliminates all but a few minutes handwork in finishing the edges of the template.

The original is either a template or lines scribed on metal layouts. This original is linked with a printer's brayer, placed on a large proof press and a grained acetate sheet laid over it. A roller exerting a total pressure of 1000 lb. is passed over the two sheets and the ink is thereby transferred to the acetate sheet, giving a negative. The negative is dusted with lampblack to hasten drying and increase the opacity of the image. The template stock is degreased and pumiced to give a tooth and then sensitized in a whirling centrifuge with a colloid containing a solution of ammonium dichromate. The sheet is dry in about 10 min. and is ready to be placed with the negative in a glass-topped vacuum frame where it is exposed to arc lights for 2 min. After being exposed it is flooded with a developer which dissolves the unhardened gelatin in 2 to 3 min., flushed in anhydrous alcohol at 200 deg. F. and inked with etching ink. The application of cool water washes away the colloid and leaves the ink. After drying with a chamois and air blast, the sheet is dusted with Dragon's Blood etch resist and the back is also coated with resist. It is baked for about 10 min. at 500 deg. F., and is then placed in a solution of sodium chloride and electro-etched, using the sheet as the anode and lead as the cathode. Five minutes of etching will give a depth of 0.005 in. at which time the sheet is removed to paint over with asphaltum varnish all the lines but those to be etched through. Replacing it in the etching tank for an additional 40 min. will etch the template free from the surrounding metal, leaving only a fillet to be filed off. The image stopped by the varnish is very durable to shop use and the accuracy of the process is 0.005 in. for any given line. Reproductions may also be made on zinc blocks.

Malleabilizing With CO-CO_2

A STUDY of the reactions occurring during the decarburization of alloy and alloy-free irons with mixed carbon-monoxide/carbon-dioxide atmospheres is described in "Archiv fur das Eisenhüttenwesen," March, 1943, by W. Baukloh, F. Schulte, and H. Friederichs.

Decarburizing investigations were undertaken on white, chilled cast iron in a mixed carbon-monoxide/carbon-dioxide atmosphere at temperatures between 950 and 1050 deg C. (1742 deg. and 1922 deg. F.), and the influence of controlling factors such as sectional thickness, time of heating, temperature and gas composition, also the influence of the carbon content in the original cast iron, as well as that of manganese, nickel, chromium, vanadium, molybdenum and sulphur on the speed of decarburization was investigated. In addition, the diffusion constants of carbon in iron were determined, and the mechanism of the reaction occurring during the decarburizing process was comprehensively clarified.

The results obtained may be summarized as follows:

(1) The speed of decarburization increases with rising temperature; the actual decarburization occurring is much greater during the initial first 2 hr. of the heating than after a further 2 hr. heating, and plotted against time, the decarburization curve is a hyperbolic function falling from the relatively high initial decarburization speed.

(2) Volatilization of the carbon occurs within practical limits only on the surface of the specimen being treated. The carbon required to maintain the decarburization migrates from the interior to the outer surface. The velocity of the decarburization is determined by the speed of this carbon migration. The work demonstrated the tenability of Ledebur:ch's theory of the decarburization reaction.

(3) The rule, established in the case of steels, that the amount of carbon volatilized within a given period of time is proportional to the initial carbon content of the material, may be applied without qualification to hypo-eutectoid white cast iron. Inclusions of primary cementite appear after a short period of heating, which increase in amount with increasing carbon content of the material, and this depresses the speed of diffusion of the carbon and in consequence the velocity of decarburization. After further heating, this preliminary retardation, however, becomes scarcely noticeable.

(4) Manganese, nickel, chromium and vanadium have litte influence in small additions, and with larger amounts of these elements, an unfavorable influence is exerted on the decarburization velocity. Only molybdenum was found to raise the speed of decarburization, at 1050 deg. C.; at 950 deg. C., the effect of this element is similar to the others in being unfavorable. Sulphur also appears unfavorably to affect the decarburization.

(5) With a low velocity of the decarburizing gas atmosphere, optimum speed of decarburization occurred with a gas mixture of about 28 per cent CO_2 and 72 per cent CO.

(6) Carbon-dioxide contents of above about 28 per cent gave rise to scaling of the iron and also to a reduction of the decarburizing speed.

(7) White cast iron can be decarburized without scaling taking place with a broad range of gas composition, corresponding to the composition of the former, provided that a certain carbon limit is not exceeded.

. . . Cast Kirksite B

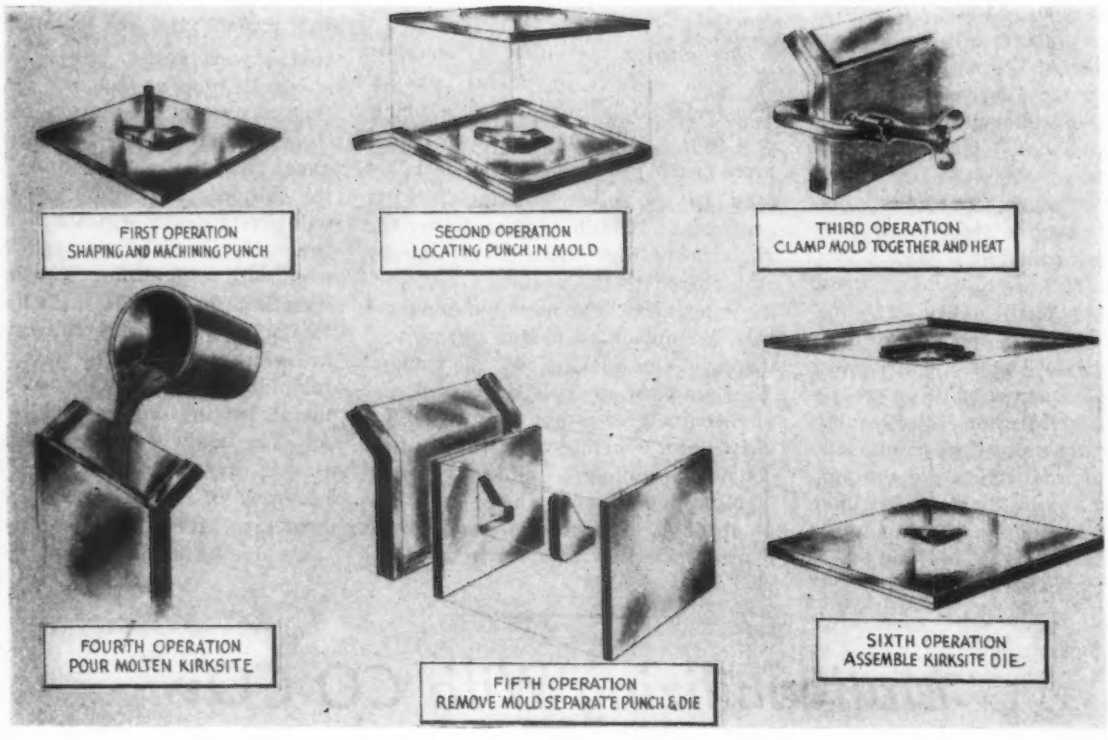


FIG. 1—Procedure for casting Kirksite blanking dies. The punch forms its own nest in the die by casting the zinc alloy around it.

FREQUENT changes in design and the large volume of different jobs encountered in airplane manufacture often create emergencies where it is almost an impossibility to produce tooling for sheet metal parts through ordinary channels. In these instances such slow operations as sawing, routing or cutting with snips generally must be employed. Every aircraft plant does some of this work on a part of its production, but it is certainly not considered good practice.

To overcome this handicap and produce sheet metal blanks that are needed in an emergency, the North American Aviation plant at Inglewood, Cal., began experimenting with cast Kirksite blanking dies.* While first attempts were rather crude, they did indicate that the method had definite possibilities. These dies have since proven very successful and several thousand have been made to date. As many as 14,000 parts have been blanked on one die, which showed no wear at all. Up to ¼ in. 24ST dural sheet has been blanked successfully, but no figures are available on the ultimate life of the die.

Two different types of cast Kirksite dies were worked out: One a blanking die for parts of a temporary nature, the other a blank and pierce die for longer runs. In the latter case, the method of casting the die onto the backing plate is not practical for temporary tooling since it requires a separate shoe for each die. For temporary tooling, use is made of universal mounting plates which can be utilized with any punch and die combination made in this manner. There is no doubt, however, in the minds of North American Aviation methods engineers that this type of die can also be used for permanent tooling under a system of proper tooling control.

Fig. 1 outlines the procedure for casting Kirksite blanking dies of the former type. First the punch is laid out by placing the part template on a piece of ¼ in. chrome molybdenum steel or ¼ in. boiler plate and scribing around it. The punch is cut out on a band saw and filed to size in the same manner as is the template. It is important that the edge of the punch be kept at a 90 deg. angle with the face of the punch. No clearance is needed and it is not necessary to surface grind the punch. An advantage of the straight sides is that when the cutting edge of the die wears (generally after 400 or 500 parts have been blanked), the die may be inverted and the life of the die doubled at no extra cost.

The mold for the Kirksite dies must be constructed so that an even heat is obtained throughout the entire area. This is very important since any unevenness in heat will result in a bad casting or uneven shrinkage. Success of casting depends on:

1—A properly designed mold.

2—Correct and even heat of mold.

3—Proper placing of the punch in relation to the contour and cutouts.

4—Proper cooling.

The mold is rectangular in shape,

For production of blanking dies from rolled material, see "Mass Production of Kirksite Blanking Dies" by W. W. Broughton, THE IRON AGE, Jan. 20, 1944, p. 70.

Blanking Dies . . .

. . . Cast zinc alloy dies are being used successfully with steel template blanking punches at North American Aviation, Inc. For temporary tooling, both halves of the set are screwed to universal die shoes. Pierce and blank template dies are made by casting Kirksite onto a keyed backing plate. This is a modification of the technique of making pierce, blank template dies out of rolled Kirksite.

o o o

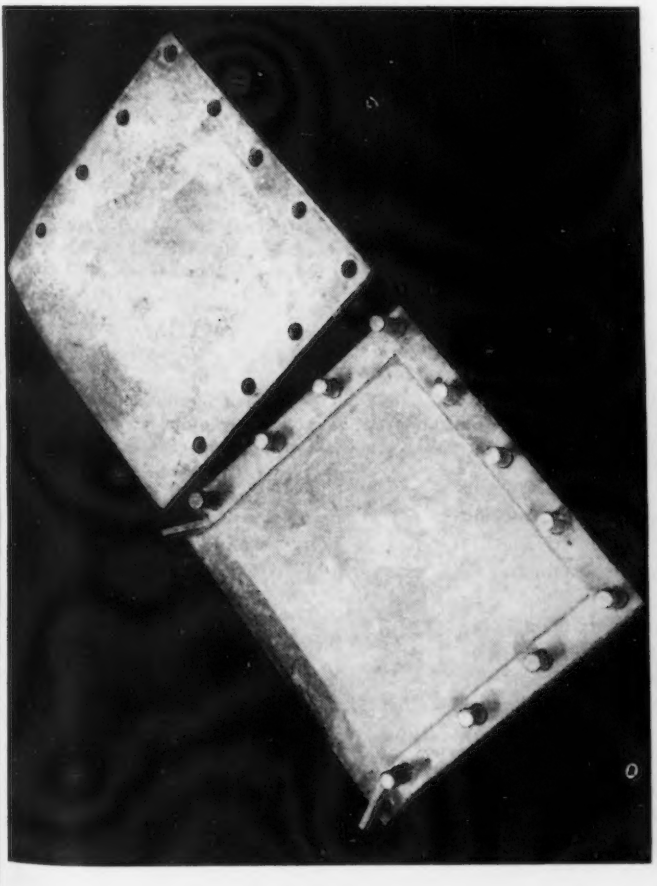
¼ in. thick and is made in two sections out of ¼ in. hot rolled steel plate with narrow (1 in.) filler strips riveted to three edges of one plate, Fig. 2. The mold is made separable to allow the punch to be placed accurately and one end is left open and is flared to act as a pouring gate for the molten Kirksite. The size of this gate must not be so large that it will cause excess shrinkage away from the punch, around which the zinc alloy is cast.

Before the punch is located in the mold, the surfaces which will come in contact with the molten Kirksite are sprayed with ferrous oxide (red oxide) to prevent the punch and Kirksite from sticking to the mold. As there is moisture present in this spray it is of utmost importance that all this moisture be driven from the mold, leaving only the dry protective coating on the interior surfaces.

The punch is placed in the approximate center of the mold so that a uniform mass of Kirksite will surround the punch. Otherwise distortion is likely to result when unequal masses in the same body of metal cool. Care must be exercised when placing the punch so that all the air in the mold will escape gradually when the molten metal enters so as to prevent blow holes forming or a geyser type eruption taking place. When the punch is in place, the side plate of the mold is tightly held against it with 11 wedges driven through slotted pins, Fig. 3. It is important that the assembly be held tightly to prevent flash forming on the die.

Pouring the Die

In the foundry, the mold and punch is heated by gas-fired torches until quite hot. This heating is of utmost importance. It has a two-fold purpose: First and most important, to drive out all moisture which entered when the red oxide was sprayed in the mold, and secondly to raise the temperature of the mold to a point where it will not absorb too much heat from the molten Kirksite, caus-



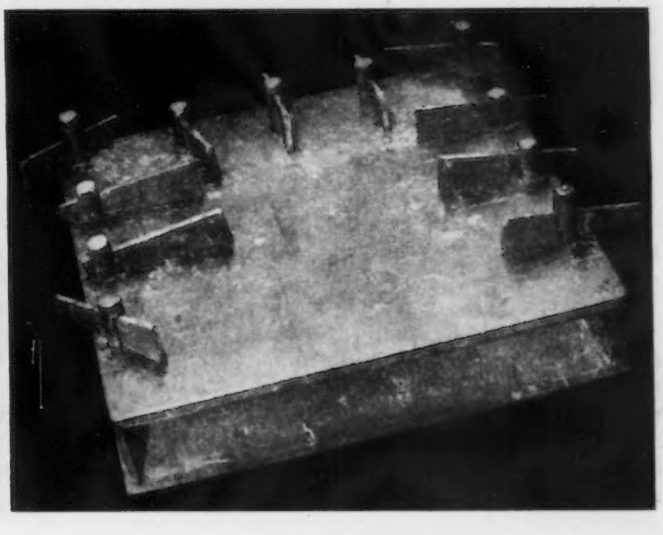
LEFT

FIG. 2—The Kirksite mold is made of ¼-in. hot rolled plate. The main body, left, has a flared lip to act as a pouring gate.

o o o

BELOW

FIG. 3—Assembled mold, showing use of clamp wedges in slotted pins.



ing it to solidify before it could reach the extremities of the mold. Although it requires only about 4 to 6 min., the heating must be performed with care, because upon it depends the quality of the casting and safety of the workers.

After the Kirksite is poured, the mold is allowed to stand for 8 to 10 min. for partial cooling. It can then be handled with asbestos gloves. The plate is removed and the casting is checked for defects, then cooled with water. Rapid cooling does not seem to cause any objectionable distortion. The gate is sawed off the die, leaving only the rectangular (mold size) Kirksite die with the punch in the die nest.

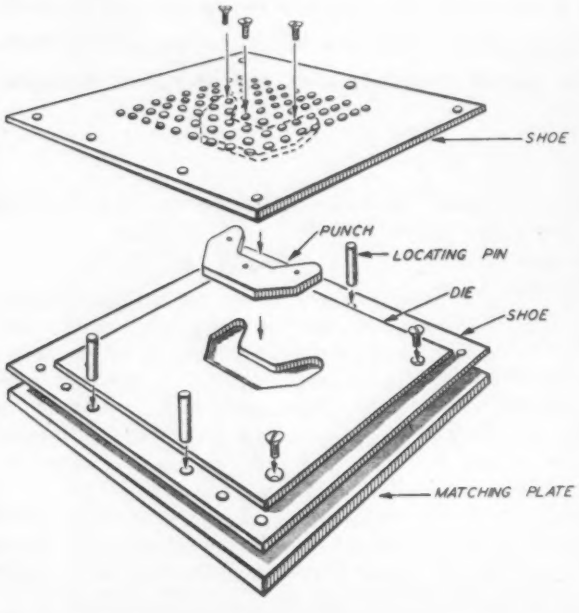
The next step is to mount the die. Since the parts to be made with these dies are of a temporary nature it was necessary to design universal setup plates on which the dies could readily be mounted when needed. For this class of tooling it should not be necessary to provide separate mounting plates for every die. The method chosen is illustrated in Fig. 4. Primarily the holders consist of two plates which have a series of evenly spaced holes through which the die and punch can be attached with countersunk head screws. Proper registration is obtained by utilizing locating pins in the same position as those used to position the die and punch on the punch press.

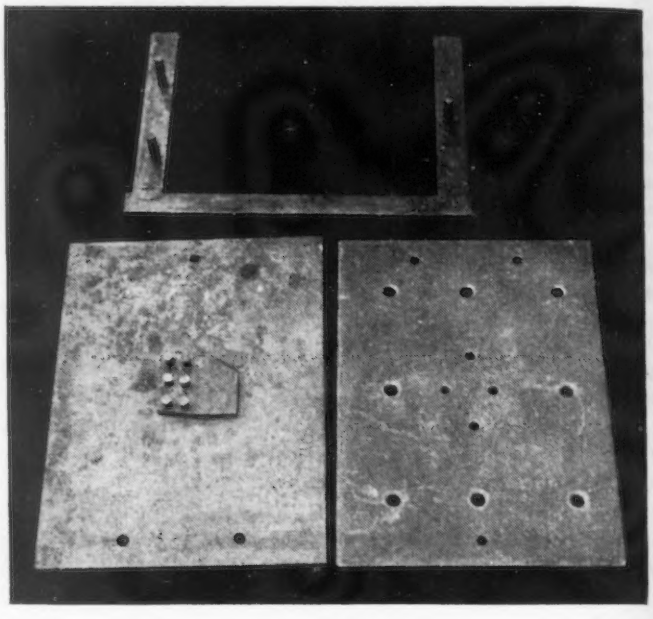
The Kirksite die is mounted on its shoe by four ¼ in. flathead screws. Holes for these screws are located by placing the die shoe on top of the die and marking the centers by means of a duplicating punch placed in threaded holes in the shoe. The holes (9/32 in.) are then drilled in the Kirksite, and are countersunk on the upper face. After the die is screwed to the shoe, the die with punch in the nest is placed in an assembly jig and the universal punch holder shoe placed over it. As indicated in Fig. 4, this shoe has many countersunk holes in it, besides three locating holes for registration with the die shoe. Screw holes for attaching the punch, usually three in number, are centerpunched through selected holes in the shoe, later to be drilled and tapped in the punch. To do this it is necessary to take the Kirksite die off its shoe and force out the punch, which is still cast in place. With both die and punch screwed to their backing plates, the stripping rubber is applied and the die is ready for application.

The time required to produce these dies is being steadily decreased and many of them are now completed in less than 1 hr. 40 min.

Blank and Pierce Dies

After seven months' experimenting with blank and pierce dies of many types, a method was devised that is actually quicker than for making the cast blanking dies just described. The dies are ready for use as soon as removed from the mold.

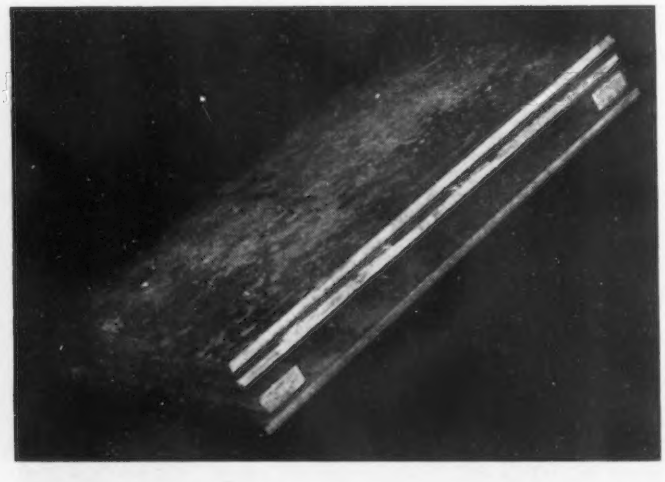




UPPER LEFT

FIG. 4—Exploded view of a cast Kirksite die and punch assembly. The rubber strippers have been omitted in this sketch.

o o o



ABOVE

FIG. 5—The U-shaped filler piece (top) forms the ends and bottom of the blank and pierce die mold. Sizes are formed by the punch shoe at left and Kirksite die shoe at right. Piercing punch shanks, shown extending from the punch proper, become bedded in the zinc alloy die.

o o o

LEFT

FIG. 6—Mold assembly for pierce and blank die before C-clamps are applied. Backing plate at left prevents zinc alloy from running out anchor holes.

In making such a die, the punch is sawed and filed to shape from chrome molybdenum plates as before, then drilled for the piercing tool holes. This punch is then attached to a permanent backing plate either by riveting or rose welding. Similarly, the Kirksite die is cast against a permanent backing plate having reverse tapered holes to form locks to hold the die in place. As before, the die shoe is made of ¼ in. hot rolled plate and is drilled to fit the three locating pins used on Kirksite die holders on the punch press. The tapered anchoring holes are formed by piercing the plate with a ½ in. punch over a 9/16 in. die hole, resulting in a hole with flaring sides. A 2 in. minimum edge distance is held on these attaching holes. When poured into these holes, the Kirksite firmly attaches to the plate. This eliminates the use of screws or rivets and the necessity for drilling and tapping holes for them.

Fig. 5 shows the pieces of a blank and pierce die before casting. Note that in this case the punch shoe, left, and the die shoe, right, form two sides of the mold. At the top is a U-shaped filler strip made of ½ x 1 in. hot rolled steel. Piercing punches have been pushed into holes in the punch. A backing plate, not shown, is clamped to the back of the die shoe which contains the ½ in. holes so that the molten Kirksite will not run out of the holes. These three plates plus the filler strip are clamped firmly together and the zinc alloy poured in at the open end. When cooled and forced apart it will be found that the die has been firmly anchored to the shoe and all that is necessary is to attach the rubber strips to make the die ready for use.

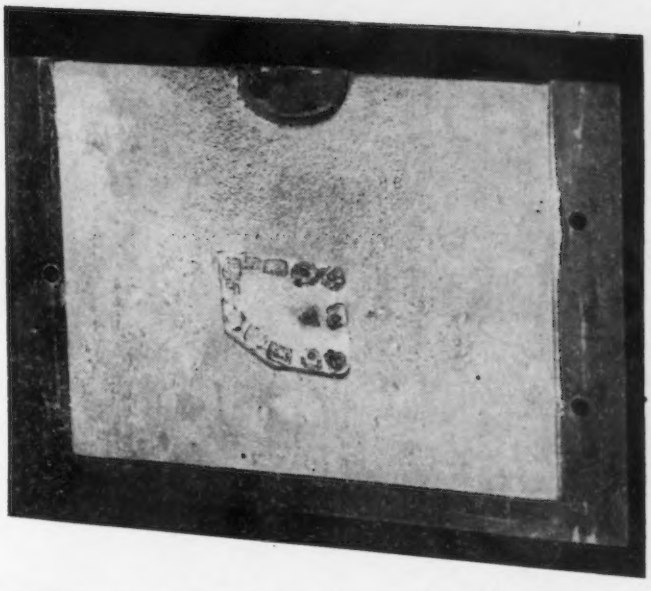


FIG. 7—Pierce and blank die cast on backing shoe. Blanking die cavity is ¼ in. deep.

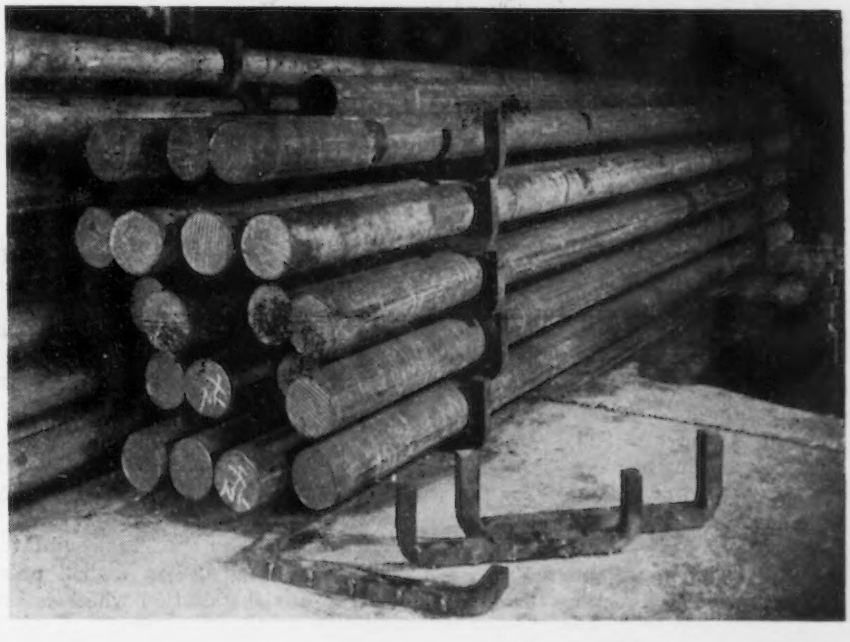
It should be noted that in the blank and pierce die, the Kirksite is ½ in. thick—equal to the thickness of the blanking punch (¼ in.) plus the extensions of the piercing punches, also ¼ in. It should be recalled that the temporary blanking dies are only ¼ in. thick and the punch space goes clear through. In the blank and pierce die, on the other hand the depression left by the punch is only half the depth of the cast die, but the piercing punches are imbedded in the Kirksite and extend through to the backing plate of the punch. The holes in the punch must be drilled through the backing plate to allow the pierced slugs to escape.

In dies of both types the punch generally fails before the Kirksite. The situation could probably be reversed by case hardening the punch. Incidentally, it was found that cast Kirksite dies are about 1½ per cent harder than rolled Kirksite. The field of these dies is extensive, particularly in the blanking of steel in small quantities.

o o o

ROLLED rod stock at Westinghouse is stored safely and neatly with cradle supports made of 1¼ in. bar stock designed to accommodate rolled stock of medium diameter. Raised beads are welded on the inside to prevent the rods from being rolled in the cradle and on the outside to prevent the cradle from shifting sidewise. In spite of their mobility, they hold rod stock securely and safely.

o o o



Broken Taps Disintegrated Electrically

By STANLEY H. BRAMS
Detroit Editor
THE IRON AGE

REMOVAL of broken tools from work in which they have become lodged has always been a problem, one that has attracted special attention during the war with salvage more important than ever before from time and material standpoints. The newest method of such recovery is by electric disintegration of the core of the tool, permitting easy withdrawal of the residual outer segments.

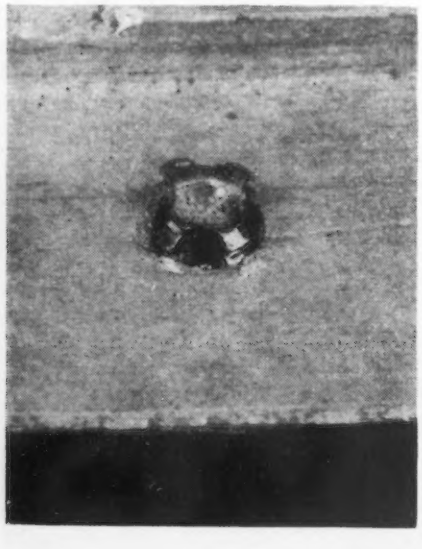
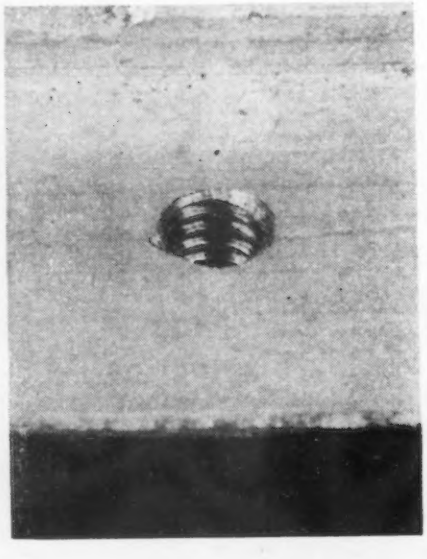


FIG. 1—The effectiveness of the Elox equipment is indicated in this group of three illustrations. At left is shown a broken tap imbedded in an aluminum part. In the center is shown the threaded hole after the tap has been removed. At right is the tap as it was picked out of the hole, the two side pieces first, then the remainder.



Two Detroit companies are now manufacturing machines to do such work, and the original salvage concept of the idea is being expanded as the equipment gets into the field. For example, the method has been applied to drilling hardened parts where more orthodox drilling operations might entail annealing of adjoining surfaces or create other problems. Other opportunities for use are also being developed by ingenious users.

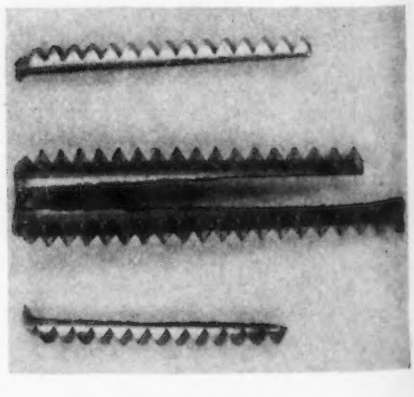
These devices function through a hollow electrode brought into intermittent contact with the work by a solenoid controlled vibrating head. As contact is broken an arc is made, creating highly localized heat, and the coolant stream then evidently breaks off minute particles of the metal, either by the contraction which follows the heat-induced expansion, by the oxidation of the metal or by both these factors. The coolant also washes out the grains of metal.

The hollow electrode and vibrator unit can be chucked in a drill press or onto any installation where it can be fed vertically. Any heat created is only at the point of electrode contact, eliminating possibility of annealing, distorting or burning of adjoining surfaces. One's fingers can be held on the metal and the electrode during work, illustrative of the absence of radiated heat.

Operation can be automatic or semi-automatic as desired. With automatic operation a mechanism for gradually feeding the head into the work must be provided. Otherwise, the operator must progressively lower the unit into the work at periodic intervals of 2 or 3 min.

Leaves Hollow Shell

The electrode gradually cuts its way in a straight path down through the metal whether the hole is being produced in a tool core or in the original work. Electrode size is governed by the diameter of the frozen tool and its type. In the case of a broken tap, according to one producer the electrode should leave about a 0.005 in. wall on all flute sides to hold the cutting teeth of the tool in place, preventing the wall from collapsing against the electrode and causing a short-circuit as it works downward. After the unit has reached



required depth on a tool, this thin wall can be easily picked through and the segments withdrawn (Fig 1).

These devices work best on hard metals, evidently due to the greater density encountered. Operation can be carried out on steel and iron alloys from file hardness down to softest grades. Speeds are slowest on the soft metals; at average they tend to cluster around 1/32 in. of depth per min., although they are widely varied not only by the hardness of the work but by the kind of metal being disintegrated and the diameter of the hole created.

Light contact of the head with the work at the down phase of the vibratory motion eliminates possibility of hammering. The setting of the machine to this rather delicate depth and the centering of the electrode over the area to be holed provide the only skill requirements for the operator.

One device of this sort is manufactured by Bertrand Machine Co., Detroit, Fig. 2, and is marketed as the Thomas tap extractor. This unit is equipped with electrodes ranging from 0.060 to 0.500 in. in size. A special coolant is used which is filtered and run in a closed circuit. It is operated with a transformer which furnishes current in six steps ranging from 2 volts, 15 amp., to 12 volts, 100 amp., choice depending on size of electrode employed.

The equipment made by Elox Corp., Fig. 3, consists of copper electrodes in sizes from 0.050 to 0.625 in. diameter. Company engineers figure they could handle work up to 1 in. diameter if required. The transformer provides current at 4 or 7 volts, as desired, the higher voltage being used on larger diameter electrodes. A special non-rust coolant is provided, designed to eliminate oxidation of steel parts.

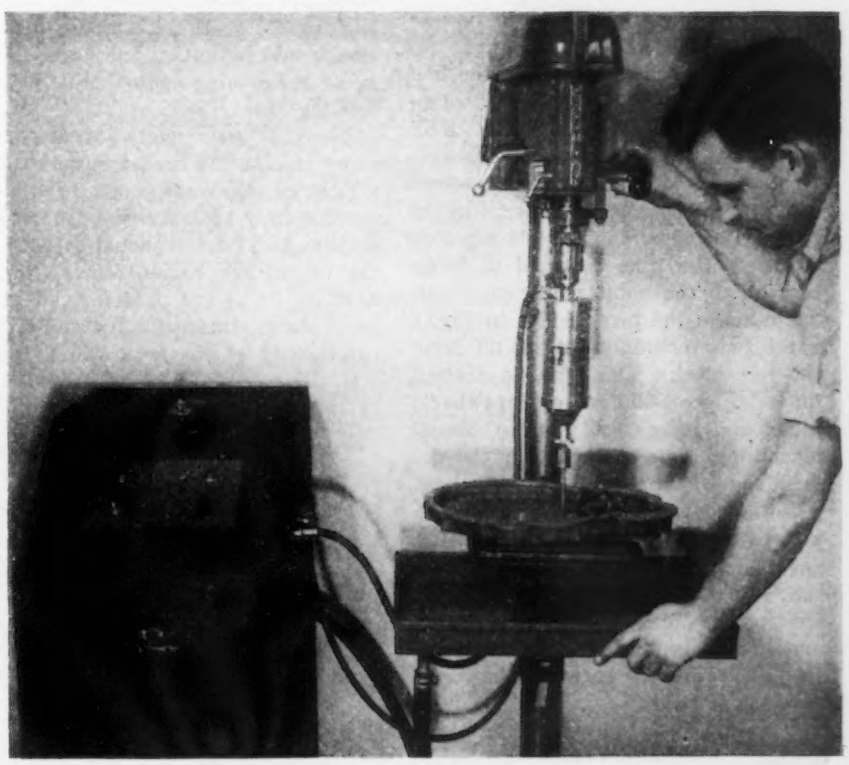
Interesting by-product uses of this device may be typified by a recent job done for a war producer in the Elox Corp. shops. The customer wanted a precision hole put in a ball bearing without annealing or otherwise injuring any remaining surface of the ball. The piece was fastened into place and the job done without difficulty.

In another instance, a die company brought in a die which after completion and hardening, was found to be lacking several holes called for in the print. The machine put holes into the die at the specified places, thus salvaging a piece of work which otherwise might have been discarded at a loss of many hundreds of dollars.

FIG. 2—This illustration shows the Thomas tap extractor in use at a Ford Motor Co. plant, eating out a tool which has become imbedded in an aircraft engine part. Choice of current is provided by the jacks on transformer cabinet shown in center.

o o o

FIG. 3—The largest Elox model is shown here, consisting of the electrode head and a waist-high cabinet mounting controls at top and providing room for head, connections, accessories, electrodes and coolant. Another Elox machine and transformer packs into two cases about lunch box size and operates with water as coolant.



Applying Carbide Tools On A

. . . Taking as an example the tooling of an eight-spindle automatic for 20-mm. tracer shells, Mr. Guttmann shows that in order to safely employ the higher peripheral speeds required for turning with carbide form tools, smaller H.S.S. drills must be selected for the initial boring operations. The cavity is subsequently brought to size with a carbide tipped gun drill and a carbide reamer. Some unconventional tool forms are illustrated.

By OTTO GUTTMANN, E.E.
Forest Hills, N. Y.

IN view of the rapid development in the use of carbide tools on most types of machine tools it is surprising that little has been done in tooling up automatic screw machines with cemented carbides. For one thing screw machine manufacturers have been reluctant to recommend carbides. Of the many plants making 20-mm. H.E. and tracer shells, which are produced almost entirely on automatics, the writer definitely knows of four which do not employ carbide tools on at least the main part of the work and there is reason to believe that nearly all other plants do not use carbide tools either. The writer had occasion to design the carbide tooling for the manufacture of 20-mm. MK7 shells on eight-spindle Conomatics. In the old setup, using high speed steel tools throughout, and operating the spindles at 650 r.p.m., at 100 per cent efficiency the time required to bring the job to the point where the shell has reached the form shown in Fig. 1 is 8.6 sec., including cutting off from the bar stock. This time is divided into 2.6 sec. idle time (drawback, index and jump) and 6.0 sec. actual machining time. The latter is determined by the boring operations. All other operations, such as forming, undercutting and cutting off can be performed in less time. Furthermore, the ½ in. diameter twist drill used in making the holes about 1.20 in.* deep and its admissible cutting speed and feed determine the speed of the screw machine spindles.

* No exact dimensions are given in this article.

Drilling Speed Governs

The recommended speed for a ½ in. high speed steel drill for boring 0.40 to 0.50 per cent carbon steel (generally SAE X-1335) is approximately 610 r.p.m. and the feed 0.008 in. per rev. On the other hand, considering bar stock of 13/16 or 27/32 in. diameter, a corresponding peripheral speed of 150 ft. per min. results for the forming tools. This is a fairly high speed for high speed steel—almost beyond its limit. At first thought therefore it would appear that raising the spindle speed to increase production would be out of the question because the drilling operation is the controlling one.

There is only one alternative. In order to obtain a higher spindle speed which, in any event, is required when carbide form tools are to be employed, smaller twist drills should be used. In the layout for carbide tools, Fig. 2, 5/16 in. drills are used instead of ½ in. drills in stations 2, 3, 4 and 5. The total depth of the hole, which is approximately 1.20 in. (H.E. chamber plus fuse plug recess) is achieved in four steps. Figured on the basis of 85 ft. per min. cutting speed for the ½ in. drill running at 650 r.p.m. the corresponding speed for a 5/16 in. drill is 1050 r.p.m. At station 6 there follows a one-lip carbide tipped gun drill, which increases the diameter of the hole from 5/16 in. to the rough diameters of 0.486 and 0.572 in., respectively. At station 7 a two-flute carbide reamer brings these two diameters to the desired close tolerances.

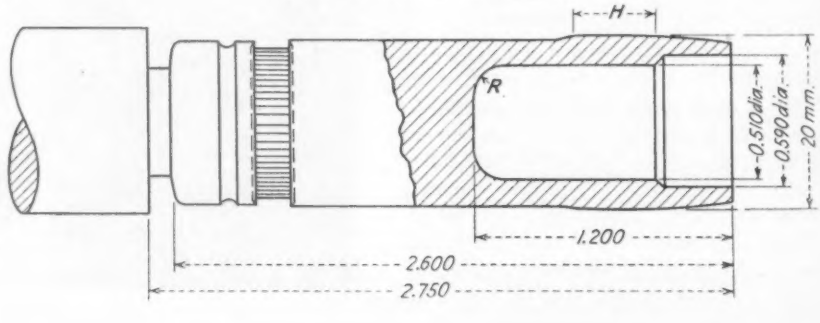
As both the ½ and 5/16 in. drills are fed with the same feed per rev. and as the drilling job requires more time than any one of the eight operations on the o.d., the increase in production obtained is strictly proportional to the spindle speeds.

By the use of ¼ in. drills an even higher spindle speed of 1300 r.p.m. is employable, and this increases the production figure further. (The writer has successfuly used No. 8 H.S.S. twist drills for drilling holes 2½ in. deep in steps of about 0.20 in. with power feed of 0.003 in. per rev. on stainless steel type 303 with 0.25 per cent selenium.) The accompanying table shows the comparative production times and hourly production obtainable with the spindle speeds of 650, 1050 and 1300 r.p.m.

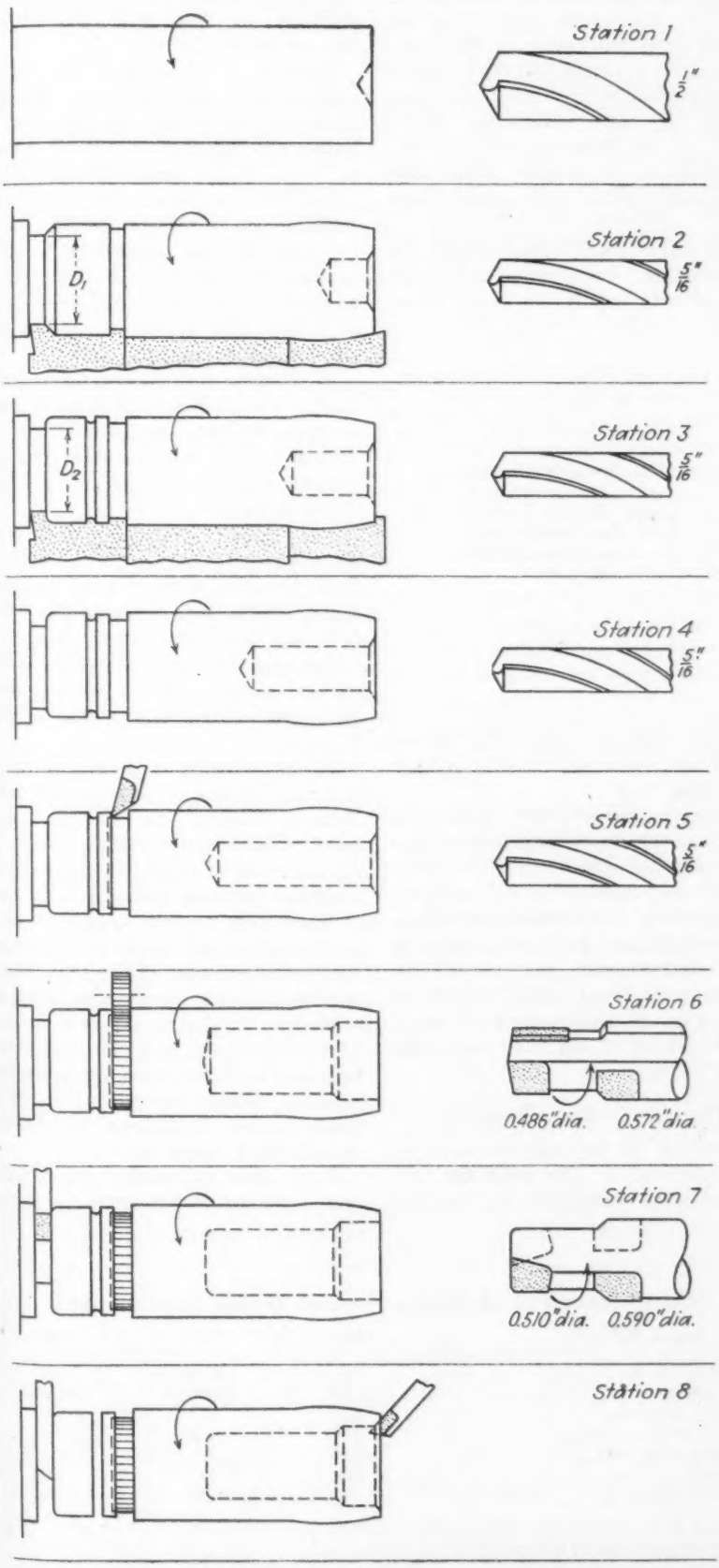
Tool Design

Form Tools: For simplicity, both the rough forming and the finish forming tools are each placed on a single cross slide station. An exploded view of the compound finish form tool is shown in Fig. 3. The middle part B has ground keys on both sides, whereas parts A and C have keyways at their corresponding sides. Each part can be shifted vertically with respect

FIG. 1—Approximate dimensions of the 20-mm. MK7 shell produced from bar stock on a multi-spindle automatic.



Automatic Screw Machines . . .



Spotting the 13/16 or 27/32 in. bar stock with ½ in. H.S.S. drill held in a stationary drill holder on the turret slide. 0.100 in. depth, feed 0.002 in. Spindle speed 1050 r.p.m. at all stations.

a) Deepening of hole, 0.280 in. with 5/16 in. H.S.S. drill held in a stationary drill holder on the turret slide. Feed 0.005 in. per rev., cutting speed 85 ft. per min.

b) Rough forming to diameter $D_1 = 0.686$ in. Carbide form tool held on cross slide. Feed 0.002 in. cutting speed 232 ft. per min.

a) Deepening of hole another 0.280 in., as in Station 2a.

b) Finish forming to diameter $D_2 = 0.588$ in. Carbide finishing tool held on cross slide. Feed 0.0015 in., cutting speed 232 ft. per min.

Deepening of hole another 0.280 in., as in Station 3a.

a) Deepening of hole to full length of 1.200 in., as in station 4.

b) Undercutting with single point carbide tool held on universal slide. Cutting speed about 225 ft. per min.

a) Widening of 5/16 in. hole to about 0.486 and 0.572 in. diameters. One-lip carbide gun drill held on the drill holder of a high speed drilling attachment, revolving at about 1000 r.p.m. in opposite direction to the spindle. Relative speed, 2050 r.p.m.; feed 0.010 in. per rev., cutting speeds 260 and 304 ft. per min.

b) Knurling. Feed about 0.003 in.

a) Reaming of hole to 0.510 and 0.590 in. diam. Two-flute carbide reamer held and actuated in the same manner as the drill in Station 6a. Feed and cutting speeds as in Station 6a.

b) Rough cut-off. Single point carbide cut-off tool held on cross slide. Feed 0.003 to 0.004 in.; cutting speed 168 decreasing to 85 ft. per min.

a) Chamfering. Single point carbide tool held in attachment on turret slide.

b) Finish cut-off. High Speed Steel tool held on cross slide; feed 0.003 to 0.004 in.; cutting speed 85 ft. per min. diminishing to zero.

Fig. 2—Layout of tooling for producing the 20-mm. MK7 shell on an eight-spindle Conomatic.

to the other in order to level the whole tool, if one or the other part has to be reground. The parts are screwed together by means of strong cap screws (about ¼ to 5/16 in.) Carbide blanks are brazed to the parts in the usual manner. Care should be taken that the side edges of the carbide blanks are stoned off so that these edges are not damaged when clamped alongside each other.

In the case of Conomatic screw machines, the whole compound tool is held in position by a clamping block, and each single part of the compound tool is supported by one or more set screws. In many applications such compound tools have proved very successful. It is obvious that they are to be preferred to tools consisting only of one piece.

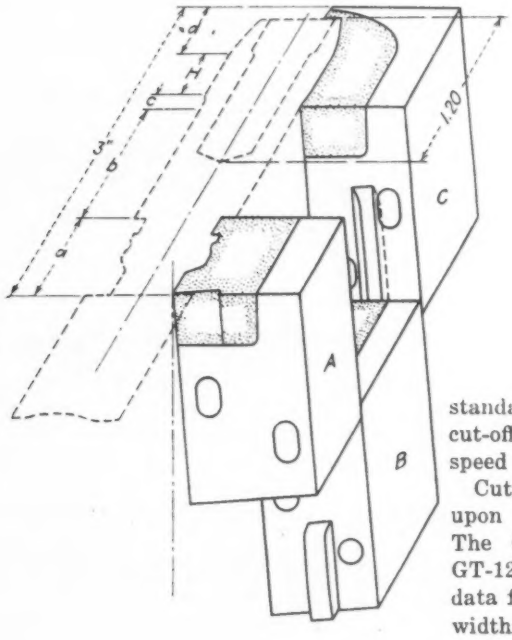


FIG. 3—Exploded view of a three section broad carbide forming tool. Each section may be adjusted separately for wear.

It is not advisable to put the rough forming and the finish forming tools at *one* station. One of the main advantages of distributing these jobs in as many cross slide stations as possible lies in the better distribution of the chips formed. Their free departure is facilitated when only a small quantity of chips is formed on each station. The only disadvantage is that the setup takes more time, but this is by far counterbalanced by fewer machine stops caused by jammed chips and the removal of them by hand.

By machining the cylindrical part H of the shell (see Figs. 1 and 3) by a single point carbide tool fixed on a turret slide attachment, The total width of about 3 in. of the forming tools can be reduced by about ⅜ in. It then remains a forming job of approximately 2⅝ in. width to be divided into three or four parts, a, b, c and d (see Fig. 3), part b representing a straight cutting edge. In recommending this compound type of forming tool, the writer has often heard the objection that this distribution of the forming job causes marred shells in the form of lines at the points where the tools are joined together in their cuts. In most plants, however, the shells are centerless ground after processing by the automatic screw machine and the grinding action makes the lines completely disappear. In some plants the distribution of the forming job, as described above, is already being done successfully with high speed steel tools.

The single point carbide tools for undercutting, chamfering and cutting off can easily be made from standard carbide tools. The finish cut-off tool, however, must be a high speed steel tool.

Cutting angles will vary, depending upon special machining operations. The Carboloy engineering bulletins GT-127 and GT-133 give excellent data for front relief, secondary relief, width of land, etc. Insofar as the form tools are concerned, they should be started with front relief angles of about 4 to 6 deg., secondary relief angles of about 8 deg., and back rake angles 0 deg.

Carbide Drill and Reamer

A sketch of the carbide drill is shown in Fig. 4. The drill has two carbide wear strips *S* for guiding purposes. The angle *A* should be as large as possible, but not less than 120 deg. An oil hole *O*, eccentrically placed, leads the coolant to the carbide blanks. The coolant—because it is under pressure—takes care of the washing out of the chips. Ordinary annealed drill rod is used for the shank. (It should be noted that this drill does not work with its dead center, which is relieved.)

It is to be noted that the one-lip carbide drill should have a point angle of about 150 to 160 deg. in order to flatten the "funnel" of 118 deg. caused by the 5/16 in. drills (2 x 59 deg.). There then remains less than 1/64 in. stock at the bottom of the hole to be removed by the succeeding carbide reamer at Station 7. A front relief angle of 5 deg. and a back rake angle of 0 deg. has proved successful for the one-lipped carbide drill.

Tests made with such drills on SAE X-1314 steel indicated that up to 4500 work-pieces between grinds can be drilled under unfavorable circumstances such as on hand fed, old belt driven lathes.

The carbide reamer, Fig. 5, must be designed quite similar to the carbide drill, but two flutes should be provided. The oil hole is placed concentrically and flows into the two flutes. The two carbide blanks at the point of the carbide reamer should overlap each other and be ground as shown in Fig. 5.

Parenthetically, it should be noted that tests made on a model 60 New Britain Gridley six-spindle automatic under most unfavorable conditions resulted in 29,700 pieces being produced between grinds in the case of the carbide reamer as against 2400 pieces with a high speed steel reamer. The carbide reamer of the type shown in Fig. 5 was not exchanged until one of the two carbide blanks on the upper part of the shank broke off. After this broken blank had been replaced, the repaired reamer turned out an additional 12,400 workpieces before the second blank broke aff.

Even greater results could have been expected under better operating

Relative Production of 20-mm. Shells at Various Spindle Speeds

Spindle Speed, R.P.M.*	650	1050	1300
Drill diameter, in.	½	5/16	¼
Other tooling	H.S.S.	Carbide	Carbide
Machining time, sec.	6.0	3.7	3.0
Idle time, sec.	2.6	2.6	2.6
Production time, sec.	8.6	6.3	5.6
Workpieces per hr.	418	572	642
Increase in prod., %	0	37	54

* Based on a uniform peripheral speed of 85 ft. per min. and a feed of 0.005 in. per rev. for the high speed steel drills.

conditions. The reamer was insufficiently cooled, especially at the blind end of the hole, which in this test was 2⅜ in. deep Straight cutting oil was used instead of soluble oil (see later comment). Lastly, the reaming speed of 90 and 105 ft. per min. were much too slow for carbides. The reamer itself was made by tipping an ordinary high speed steel twist drill with Carboloy grade 78B blanks.

For designing the one-lip drill and the reamer, valuable data is to be found in "Cemented Carbide Gun Drills" by Walter R. Meyer and William A. Kimsey, THE IRON AGE, August 13, 1942. In this connection, it might be mentioned that Carboloy Co., Inc., produces small caliber gun drills, THE IRON AGE, September 17, 1942.

The twist drills used in Stations 2 to 5, inclusive, should be of the high-spiral type drill (H.S.S.), such as Type 957 of the Cleveland Twist Drill Co.

Assuming that SAE X-1335 is to be machined and that feeds are employed as shown in the layout, the cutting speeds of about 230 ft. per min. for the carbide form tools and about 260 to 300 ft. per min. for the carbide drill and carbide reamer represent a good average. The same holds true for the single point tools. The knurling tool can stand 250 ft. per min.; besides, such tools are easily replaced and are comparatively inexpensive.

Carbide Usage Factors

All carbide tools should be ground with diamond wheels of at least 220 grit. The cutting edges—particularly those on the form tools—should be slightly dull. For all this, as well as for grinding chip breakers, the manuals of the carbide manufacturers give very good instructions. As far as carbide grades are concerned, one should start with a comparatively tough grade, such as Carboloy 78B or Kennametal KM, especially in the case of form tools.

Depending upon the results obtained from the use of these grades, tougher or harder grades should also be tried. Because each type of machine tool has a peculiarity more or less of its own, no exact directions in this respect can be given. Nowadays the hardness of the work material differs rather considerably. For bar stock with hard spots, straight tungsten carbide—although it is designated for use on nonferrous metals—often proves very successful.

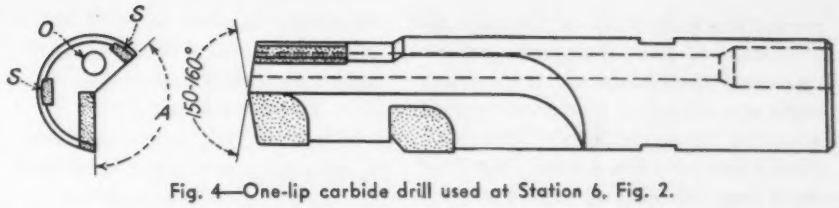


Fig. 4—One-lip carbide drill used at Station 6, Fig. 2.

One should bear in mind that carbide tools need far more cooling than lubrication. The high cutting speed causes temperatures of about 660 to 750 deg. F. at the cutting edges. Straight cutting oils have little cooling property. Tungsten-titanium and tungsten-tantalum carbide has in itself, however, a kind of self-lubricating property. Therefore, a soluble oil solution is recommended as a coolant. This type solution also proves successful for drilling carbon steel with high speed steel drills. Both the tool and the work should be cooled adequately and in a constant uninterrupted flow, which must hit the cutting edges directly unhindered by chips.

The disadvantage of soluble oil—namely getting under the turret and thereby causing sticking — is negligible, particularly in the case of 24-hour work. In order to achieve good results in washing out the chips formed by the carbide drill and reamer, the pressure of the coolant flowing through the oil holes should amount to 200 to 250 lb. per sq. in.

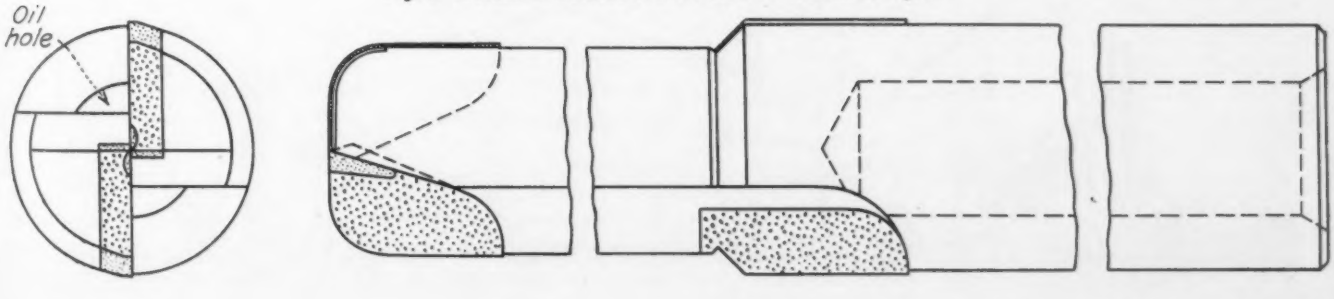
Assuming the size of depths and feeds of cuts and the cutting speeds mentioned in the layout, a motor of approximately 18 to 20 hp. is required.

It has been observed earlier that one is quite generally confronted by a reluctance to employ carbide tools on multi-spindle automatic screw machines. No reason can be seen as to why carbide tools should be successful when used on other machine tools and yet not on automatics. Recently the writer quite successfully employed carbide tools (single point tools and reamers) on belt-driven turret lathes, 40 to 50 years of age, which were hand fed. Nothing but the drive shafts were changed on these lathes (which were running at a maximum of 300 r.p.m.) in order to speed up the spindle to 800 to 900 r.p.m. Nothing happened except that the spindle bearings occasionally became a bit warmer than usual. On the other hand, 450 workpieces were made in 8 hr. as against 150 with H.S.S. tools.

In order to get these results, first a proper and intelligent well thought out application is necessary, and, second, an unswerving desire to succeed. Regarding the costs of carbide blanks, the often encountered objection that the blanks are expensive does not prove true today. It is true, however, that the manufacture and especially the maintenance of carbide form tools are more expensive than in the case of high speed steel tools, but then only when such tools are used until the cutting edges chip off. Regrinding such tools is often very time-consuming, if not unremunerative. A carbide tool should work for a certain predetermined amount of time and then be exchanged, regardless of whether or not it turns out workpieces "still good in size." When such tools are used beyond the predetermined time, in nearly all cases it leads to a point where the cutting edge chips.

In this connection it must be pointed out that carbide counterbores or reamers are tapered in such a way as to

Fig. 5—Details of carbide reamer used at Station 7, Fig. 2.



permit the possibility of frequent regrinding. If such tools are used excessively, the lands of the cutting edges are subjected to excessive wear too, and thus needlessly lose size. (Small particles are always found between hole and cutting edge while the tool is working.)

Replacement of carbide blanks is easy and far less expensive than is generally believed. The shanks of carbide tools can be used again and again. The writer used the shanks of counterbores (steps of 0.446 and 0.804 in. diameter) for as many as six to eight times, each time obtaining about 25 to 30 regrinds per tool.

It is, of course, understood that the foregoing study has not exhausted all the possibilities, particularly in regard to the distribution of the single point tool operations. These operations are dependent upon the type of screw machine, its number of spindles, tool slides, cross slides, types of attachments and last, but not least, upon the limitation of the spindle speed as given by the manufacturer of the screw machine.

The purpose of this study is to point out that a trial is worthwhile, even when the screw machine manufacturer does not recommend it. Cemented tungsten carbide is no longer the touchy, brittle material of six or eight years ago. It is tougher and, in the eyes of the man using it in average work (which amounts perhaps to more than 90 per cent of all work), it is better than ever before.

Continuous Cold Drawing Machine

DEVELOPMENT of a continuous cold drawing machine by the United Engineering & Foundry Co., Pittsburgh, marks a major improvement in the cold drawing of tubes, rods and shapes for both ferrous and non-ferrous materials. Basic principles and practices of cold drawing have been retained, but have been elaborated upon to obtain a continuous cycle in what has heretofore been an intermittent operation.

The illustration shows the model of a four hole machine. Essentially, the unit consists of a draw chain which pulls two sets of bars simultaneously by means of tong carriages which are brought back to the starting position by an overhead transfer system. In the illustration, carriage C farthest to the left is about to complete the drawing of the two top rods while carriage B has just begun to draw two lower rods. Carriage A and D are shown on the upper track being returned to the charging position. Carriage A will be rolled into the elevator cradle and will be lowered into the gripping position to pick up the protruding points of the next two upper rods. Eventually carriage D will be traversed back to the right and lowered to pick up the next set of rods to be pulled through the lower dies. The carriages are kept in continuous circulation. Thus, in a four hole machine, except for the brief interval it takes for a carriage to grasp a new pair of pointed rods, there are always four rods or shapes being pulled through the dies.

Because the tong or gripper carriages travel in a continuous circle, there is no lost time for the conventional tong carriage return and because the carriages are pulling four bars simultaneously, this continuous unit has five times the capacity of the ordinary draw bench. Other features pointed out by United Engineering include:

Fully automatic control of the travel cycle.

Only one bench operator required.

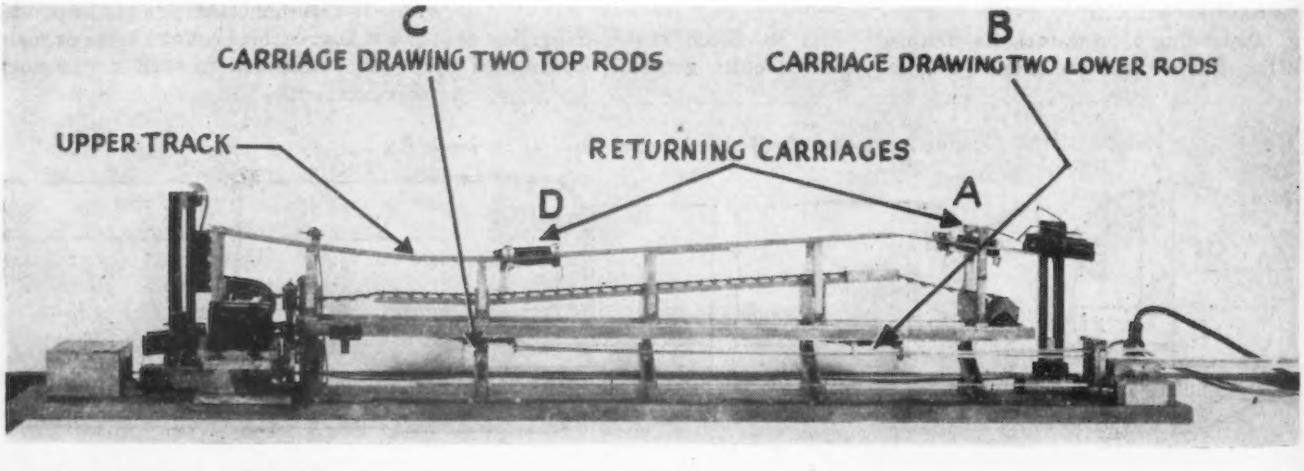
The carriages are equipped with oil hydraulic shock absorbers and "sure grip" point grippers.

The chain is inverted (over the work) providing free access to the work and automatic unloading of the work downward into a cradle.

Straight pull of the carriage on the chain with the pivot of the hook on the centerline of the chain.

Greater safety if the material breaks while drawing.

Automatic release of the work into the cradle when the drawing is completed.



Aluminum Welding With Liquefied Gas

By J. V. KIELB
Staff Engineer for the Works Manager, Easy Washing Machine Corp., Syracuse

SCARCITY of hydrogen gas has resulted in the investigation and acceptance of propane ($C_3 H_8$) gas as an alternate fuel for welding aluminum sheet metal and castings. This type of gas is a by-product of petroleum or natural gas and has been used extensively for home gas cooking, water heating, refrigeration, etc. Largely due to its low cost and safety features, its application in the past few years has spread tremendously in such fields as cutting of steels, fuel for carburizing furnaces and other heat treating operations. There is an abundance of this gas, but due to limited number of steel cylinders at present, the amounts consumed do not compare with that of acetylene or hydrogen.

Propane is stored in steel cylinders like hydrogen, but these cylinders are larger in diameter and length. The cylinders are tested at 2000 lb. hydrostatic pressure and have a working pressure in excess of 1000 lb. per sq. in. Their liquid gas capacity is 100 lb. This amount is employed in applications such as manifold systems or volume applications. In some instances tanks of 40 and 60 lb. liquid gas capacity are also used.

In investigating the characteristics of this type of gas, many advantages were revealed, although some disadvantages were also noted. With regard to safety, one of the particular advantages of this type of gas is its relative low pressure which is 115 lb. at 70 deg. F. in a full cylinder, compared with 1800 lb. for hydrogen and 275 lb. for acetylene. The kindling temperature of propane, on the other hand, is 985 deg. F. which is lower than either hydrogen (1075 deg.) or acetylene (763 deg.). Another feature of these liquefied petroleum or natural gases is that they do not create an explosive mixture in the cylinder. Their explosive range is 2.5 to 9.5 per cent while the hydrogen range is 4 to 73 per cent and acetylene is between 2.5 and 80 per cent.

Other advantages of propane for industrial applications are: First, the standard cylinder holds 859 cu. ft. of gas yet weighs only 192 lb. full, while the acetylene cylinder of 300 cu. ft. weighs 231 lb. and a hydrogen cylinder of 200 cu. ft. weighs 136 lb. Secondly, these propane cylinders are easily handled and because of the larger volume of gas evolved do not have to be changed in the setup operation as often as do acetylene or hydrogen cylinders. Finally, in its application to welding aluminum, it was found that the propane flame is easier to control in comparison to hydrogen, due to the fact the cone is easily distinguished from the feather.

Less Heat Generated

In other applications, such as cutting steels of various thicknesses, it was found that less heat is generated in the cutting area, thus preventing round edges which often develop in acetylene cutting. However, this factor generally depends on the training and experience of the individual operator. In this connection it should be noted that the combustion temperature of both propane and hydrogen is about 4000 deg. F., while that of acetylene is approximately 6300 deg. Another advantage of propane's low temperature is that the flame cut edges are slightly more machinable than acetylene cut edges. It has been found that Rockwell hardness readings are lower by two to three points.

In checking the thermal content *per cylinder* of these liquefied petroleum gages, they were found to contain twice as many B.t.u.'s as acetylene and 13.8 times more than a hydrogen tank. Using this gas as a fuel for carburizing and heat treating operations, it proved to be very economical and its pressure could be easily maintained at all times. This is because of its unusual high purity and low boiling point. These statements showed clearly that liquefied petroleum gases could be applied in many more ways, especially during this emergency.

Welding Aluminum

In applying propane and oxygen for the welding of aluminum, the setup of these gases was similar to that of acetylene and oxygen or hydrogen and oxygen. With the propane gas a two-stage acetylene regulator was used for controlling the pressure. At the time, this application of an acetylene regulator eliminated one of our difficulties in welding aluminum, namely the shortage of hydrogen regulators.

In preliminary investigations such tests as were used in welding aluminum with hydrogen or acetylene were set up for testing propane. Sample plates of butt, lap and fillet welds were made and tested. Results proved satisfactory. It was found that the weld metal penetrated to give good fusion as well as uniform flow resulting in good appearance and easier handling of filler rod. In tensile test-

(CONTINUED ON PAGE 152)

New Alloys and Techniques

Feature Foundrymen's Convention

BUFFALO bulged last week, and honeymooners slept on park benches, when foundrymen took over the town for the American Foundrymen's Association's third war production congress.

Technical sessions found brain children of the 1943 meeting grown to full stature in the war production scheme, and parading new mental offspring designed to give the foundrymen something to talk about. Where emphasis the previous year had been on materials and products, more serious attention this year was given to the increasingly restrictive manpower situation.

Back on the scene was the AFA foundry show, with nearly 250 companies displaying such wares as could be toted in conformity with requests to conserve shipping space.

A new name on the meeting program was the recently organized Committee on Castings Inspection, which sponsored a session to mull over inspection from the standpoint of the consumer, purchaser and, very much to the point these days, the Navy.

Officers chosen for the 1944-45 season at the annual business meeting were headed by Ralph J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich., president, and Fred J. Walls, manager, Detroit office, Development and Research Division, International Nickel Co., vice president. New directors are L. C. Wilson, Reading Steel Casting Division, American Chain & Cable Co., Inc., Reading, Pa., the retiring president; R. T. Rycroft, Jewell Alloy & Malleable Co., Inc., Buffalo; Frank J. Dost, Sterling Foundry Co., Wellington, Ohio; Joseph Sully, Sully Brass Foundry Ltd., Toronto, Ont.; and Samuel D. Russell, Phoenix Iron Works, Oakland, Cal.

In recognition of "his outstanding contribution to the foundry industry and the Association, especially for his work in the development of steel melting practices," A. W. Gregg, executive engineer, Whiting Corp., Harvey, Ill., was awarded the J. H. Whiting Gold Medal.

W. G. Reichert, president, G. W. Reichert Engineering Co., Newark, N. J., was honored with the Joseph S. Seaman Gold Medal in recognition of "his outstanding service to the foundry industry and the Association, especially for his work in the educational and research fields of foundry sand and its control."

Two life memberships were awarded, to John Hill, president, Hill & Griffith Co., Cincinnati, a charter member of the A.F.A., and to Herman E. Alex, Rock Island Arsenal, Rock Island, Ill., who has served the organization for over 50 years.

Technical meetings and discussions were the main feature of the show, and the interest in these meetings reached an all time peak. Nearly every session was crowded and the discussions carried meetings over their allotted periods. Highlighting these meetings was the Second Foundation Lecture, delivered by H. W. Gillett of Battelle Memorial Institute of Columbus, Ohio, on Cupola Raw Materials. The Foundation Lecture was established in 1942 to bring authoritative presentations of foundry problems before the Association membership. John W. Bolton, of the Lukenheimer Co., Cincinnati, delivered the first Foundation Lecture at the St. Louis meeting on April 29, 1943.

Abstracts of some of the outstanding papers at the meeting are presented in the following.

o o o

Al-Zn-Mg Natural Aging Alloy

DEVELOPMENT of a sand cast aluminum base alloy, containing magnesium, zinc and small amounts of titanium and chromium, that attains high physical properties by natural or artificial aging without a previous solution or quench heat treatment was described by Hiram Brown, metallurgist, Frontier Bronze Corp., Niagara Falls, N. Y.

Early misconceptions with regard to aluminum - zinc - magnesium alloys brought on by faulty alloy ratios and erroneous beliefs, combined with popular acceptance of aluminum-copper alloys, retarded until recent development of the former type in the United States, although strides had been made in their use in Germany, Brown related.

Eventually there was developed an alloy designated by A.F.A. as B-81 in which the physical properties obtained without aging were considered equivalent or superior to most of the high strength heat treated alloys which had gained favor here. Its composition is:

Element	Content, Per Cent
Zn.	5.25
Mg.	0.50
Cr.	0.50
Fe., max.	1.00
Ti.	0.2
Cu., max.	0.4
Si., max.	0.3
Al.	Remainder

Properties of this alloy specified in Army-Navy-Air Corps Specifications AN-A-17 are yield strength, min., 20,000 lb. per sq. in.; tensile strength, min., 32,000 lb. per sq. in.; and elongation, min., 3.0 per cent in 2 in.

After alloy B-81 is cast and allowed to stand at room temperature, a

RALPH J. TEETOR, president of Cadillac Malleable Iron Co., Cadillac, Mich., was elected president of A.F.A. He served as vice president last year and as director from 1933 to 1935. He has been active in the affairs of the Malleable Iron Division Advisory committee as well as other A.F.A. committees and also served as director of the Western Michigan Chapter.

FRED J. WALLS, manager of the Detroit Development and Research Division office of International Nickel Co., was elected vice president of A.F.A. He served as a director from 1939 to 1942 and as a member or chairman of the Gray Iron Division. He presented the annual exchange paper of A.F.A. to the Institute of British Foundrymen in 1930.

change in the physical properties takes place, rapidly at first, then more slowly later in the process. Yield and tensile strength are raised considerably and elongation is progressively decreased. The properties of the alloy reach the above specifications within three weeks at room temperature and increase very little thereafter. If it is undesirable to wait for the natural aging cycle, the alloy can be artificially aged in a few hours to meet the required specifications. Besides eliminating difficulties associated with heat treating, this alloy has made possible the casting of large pieces which would otherwise necessitate large, expensive heat treating equipment, and has made possible the casting of high strength aluminum in foundries which do not have required heat treating facilities.

Artificial aging cuts the time required to secure maximum physical properties from a matter of days to hours, and has the added advantage of relieving casting strains and stabilizing the metal so that close tolerance machining can be done without growth or warpage occurring. The artificial aging of alloy B-81 was found to be much more sensitive to temperature than to time, it being indicated that metal properties were well stabilized after aging 10 hr. at 356 deg. F. A rise to 400 deg. F. resulted in over-aging. Holding at room temperature for 24 hr. or more prior to artificial aging also improved physicals. B-81 also will re-age when cooled to room temperature after exposure to high temperature.

Tests also were cited to prove that the alloy is not materially affected by welding, and that it has high corrosion and stress corrosion resistance, shock resistance, and that it can be readily machined and anodized.

The alloy was found to be less sensitive to high temperatures and porosity than the standard aluminum-copper alloys, and its tendency to pick up gas during melting much less. Brown declared that castings made from the alloy have a very high percentage of the strength obtained in separately cast test bars, both in light and heavy sections. The alloy has been used in a wide variety of commercial applications ranging from ventilating fans for firing chambers of ships to oxygen control units for high altitude flying.

Foundry characteristics were said to be comparable to those of the 4 per cent copper alloy but not as good as those of the 7 per cent silicon, 0.3 per cent magnesium alloy. Machinability of B-81 was counted as excellent, and the machined metal described as having a high luster. Coatings produced by the chrome and anodic treatment were declared to be entirely satisfactory.

o o o

Superheating Gray Cast Iron

PAST experiments on superheating — raising the temperature above liquidus—of cast iron have been beset by gremlins in the form of a welter of closely associated variables influencing the ultimate increase in mechanical strength of castings. Hence, A. William Schneble, Jr., metallurgical engineer, the Advance Foundry Co., Dayton, Ohio, and John Chipman, professor of metallurgy, Massachusetts Institute of Technology, sought to mend discrepancies in literature on superheating effects by sifting out these variables and tagging the more important ones.

Some previous investigators had postulated that superheating gray cast iron dissolved residual graphite nuclei, eliminating them as seeds for crystallization during solidification, and thus promoting the formation of fine graphite. Another group attributed to non-metallic nuclei a similar effect, believing that superheating rendered such nuclei ineffective by melting them at high temperatures, coalescing them and floating them out of the melt, or by reaction with other substances in the melt which lowered their melting point, causing the same effect. More attractive to Schneble and Chipman, however, was various evidence indicating that the presence or absence of gases has a pronounced effect upon the microstructure of gray cast iron even though no theories had accounted for such effect.

The authors' investigation was aimed at factors causing superheating effects, rather than exact determination of their magnitude and procedure was planned to separate the effects of nucleation from the effects of gases. A 10 lb. induction furnace, built for melting and casting in vacuum or controlled atmosphere and with carefully controlled temperature, was used.

Schneble and Chipman reasoned that the solution or the formation of graphite nuclei and the elimination or formation of non-metallic nuclei should take place with sufficient rapid-

L. C. WILSON, general manager of Reading Steel Casting Division of American Chain & Cable Co., Inc., Reading, Pa., and retiring president of A.F.A. was elected to a three-year term of directorship.

R. T. RYCROFT, president of Jewel Alloy & Malleable Co., Inc., Buffalo, was elected a director for three years.

FRANK J. DOST, vice president and secretary of Sterling Foundry Co., Wellington, Ohio, was elected a director for three years.

ity so that their influence could be observed in the melts superheated in air if these nucleation theories were valid. However, they found the reported effects of superheating entirely absent in melts thus superheated. Likewise—still presuming validity of nucleation theories—nucleation should exist in vacuum to some extent and the solution or precipitation of graphite nuclei should be practically independent of the atmosphere above the furnace and the pressure of this atmosphere. The formation of nonmetallic nuclei would be influenced by the pressure on the melt but would probably be removed by superheating in a vacuum. Superheating in vacuum, actually, did not produce any change in the properties of the metal as a function of the temperature.

The experiments reported showed that "superheating effects" were found in melts superheated to a constant temperature, and held for various lengths of time in an enclosed furnace atmosphere. The greatest effects were found at the high temperatures. When the high temperature melts were repeated in nitrogen, the effects were eliminated. Thus, Schneble and Chipman concluded that the effects of superheating were not due to any nucleation mechanism, and that they were very probably due to variations in the gas content of the metal. Finally, they singled out CO as the chief factor producing the effects of superheating. Although very little was offered as to the "why" of this action, it was tossed out as a possibility that CO might catalyze the decomposition of iron carbide, accelerating graphitization during solidification. It was found that melting in hydrogen produced the same type of tensile strength curve as CO, with marked effects depending upon time and temperature of superheating, but with exactly opposite effects on structure.

"The tensile strength of cast iron is determined by graphite size, shape and distribution, by cell size, and matrix structure," the authors reported. "It so happened that the various combinations of these factors produced the same type of tensile curve for both hydrogen and carbon monoxide, but two entirely different combinations were found in these curves." Then it was argued hydrogen might remove CO from the melt by the formation of methane and water vapor, and, hence, remove the mechanism for the graphitization of carbide. It was acknowledged that hydrogen usually is not present in sufficient quantities in most melting operations to account entirely for all of the effects of superheating.

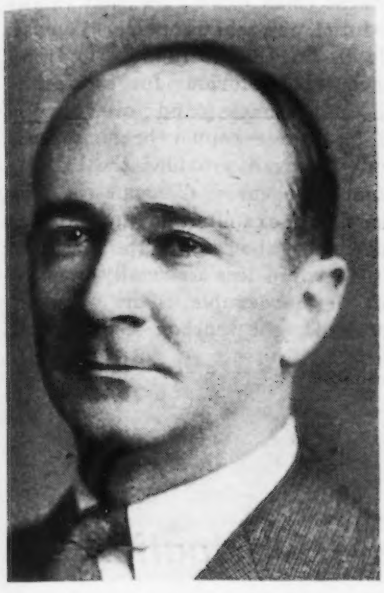
The experiments also show that superheating in vacuum or in dry nitrogen was to be substantially without effect except the indirect effect of a shift in composition. In air, superheating for a minimum length of time was without effect but holding at temperatures 5 to 30 min. in a closed furnace increased markedly, then decreased tensile strength. Superheating in nitrogen saturated with water vapor caused a slight increase in tensile strength, but not sufficiently large to account for the effects of superheating.

o o o

Hardenability of Some Cast Steel

ALTHOUGH J. B. Caine, metallurgist, Sawbrook Steel Casting Co.,, Lockland, Ohio, presented considerable data on the general subjects of prediction and control of hardenability of cast steels, he pricked up the ears of the entire steel industry with advance data on comparison of hardenability curves of cast steel versus hotworked steel. Attention given to the effect of aluminum upon steel's hardenability, through its effect in reducing grain size, foreshadows Caine's data showing that the hardenability of hotworked steel is slightly lower than that of the comparable cast steel, both for carbon and alloy specimens. The difference is attributed to the slightly higher silicon and residual aluminum contents of cast steels, all of them aluminum killed, used in the experiment.

End quench tests were made on 11 types of cast steel, namely, SAE 1020, 1030, 1040, 1330, 2220, 2310, 2320, 4130, X4130, 4140, and a medium manganese steel with 0.30 per cent carbon and 1.50 per cent manganese.



JOSEPH SULLY, of Sully Brass Foundry, Ltd., Toronto, Ont., was elected to a three-year directorship.

SAMUEL D. RUSSELL, president of Phoenix Iron Works, Oakland, Calif., who was elected to a three-year directorship of A.F.A., will represent the West Coast membership.

In his comparison between tests of carbon and alloy steels, Caine emphasized that carbon is the only element in steel that gives hardness, and that addition of alloys only increases depth of hardness, that is, hardenability. He pointed out that when alloy castings are to be heat treated, the chemical composition must be controlled within much closer tolerances than are necessary for slowly cooled castings, or even heat treated carbon steel castings, if the hardenability is to be controlled within reasonable limits. He buttressed this assertion with the Grossmann theory that each alloying element acts as a multiplier in its effect on hardenability. Thus, from the standpoints of cost and quality as well as alloy conservation, foundries should select scrap analyses where variations in residual alloys are minimized, that is, analyses not dependent upon a single alloy for hardenability, but on two or three, preferably those that are likely to be in the scrap and are not oxidized and removed during melting.

Caine concluded that the hardenability of cast steel can be calculated from chemical composition and grain size, using the formulae developed for hot worked steel. He emphasized that the curves which he has developed from the 11 steels tested are applicable only to fine grained aluminum killed cast steel, and to simple sections.

o o o

Effect of Copper in Cast Steels

WAR time development of the National Emergency steels, of which the 8600 and 9400 series are not the least prominent, has been a boon to the nation's conservation of scarce alloying elements through utilization of residual alloys in scrap, but a headache to many melters confronted with unexpected contamination through improper scrap segregation. Like the "man who came to dinner," copper often joins the party in this manner and, because it is not oxidized in the melting process, remains and accumulates as a residual. Because, in formulating the NE analses, no account was taken of the role of copper, present in practically all scrap in amounts of 0.03 to 0.50 per cent and more, and because no other information was available, C. T. Greenidge, M. C. Udy, and K. Grube, all Battelle Memorial Institute metallurgists, added copper in amounts up to 0.50 per cent in NE 8630 and 9430 and a low alloy manganese-molybdenum steel, and up to 1.35 per cent in a type corresponding to NE 8720 but containing 10 points more carbon. Hardenability of the steels was determined by the end quench method, and tensile properties and hardness were obtained after quenching and drawing, and after normalizing and drawing. In addition, the effect of copper on low temperature notched bar toughness was investigated.

The steels in the NE 8630 and 9430 group, and the manganese-molybdenum type were deoxidized with 0.10 per cent aluminum added to the bath about one minute before pouring, while the remaining heats were deoxidized with silicon, a distinction which proved important in relation to toughness at low temperature.

Data secured suggested that presence of copper in amounts of 0.50 per cent does not change the usual tempering practice required on water quenched low alloy cast steels to reach a desired hardness level. Thus, if copper is present as a residual in such alloy steels, no adjustment in tempering temperature is necessary.

Normalizing before tempering, however, makes copper nudge up hardness, the higher copper steels showing as much as 25 Brinell points harder after a 400 deg. F. draw than low copper comparison steel. This effect is regarded as dependent upon the hardenability of the steels, as the hardness of the normalized specimens from the three base analyses also were dissimilar. The normalized manganese-molybdenum steels and the NE 8630 type have a somewhat higher hardness level than the NE 9430 series, which is in agreement with their hardenability rating. Beyond a tempering temperature of 1000 deg. F. the steels rapidly approach the same hardness, and at 1200 deg. F. all have about the same Brinell value.

Copper up to 0.50 per cent induced no change in tensile properties of fully quenched and drawn steels. When present in amounts above one per cent, there was an increase in strength and a corresponding drop in ductility in normalized steels, and heat treatment suitable for developing precipitation hardening brought in the usual precipitation hardening behavior at this copper level.

Low temperature toughness of the steels was not greatly influenced by copper in percentages up to 0.50. The authors pointed out that low temperature behavior is vastly influenced by full quenching as against slack quenching and that behavior of various castings in service, with many variable conditions, might differ markedly from notched bar test results. In the tests, those steels deoxidized with silicon rather than with aluminum experienced drastic losses in low temperature toughness above —60 deg. F. The aluminum deoxidized steels, on the other hand, experienced no sudden drop in toughness and gave good Charpy values down to —60 deg. F. Specimens tempered to 230 to 250

Brinell dropped off more rapidly from −40 to −60 deg. F. than did specimens tempered to 300 to 320 Brinell. All these effects, it was noted, are entirely normal and common to steels of this general class, with or without copper. Hardenability curves for the cast specimens, it was indicated, were practically identical for those of wrought steels of the same copper content and composition. Copper up to 0.50 per cent had only a mild hardening action in the four types of steels tested, but a more pronounced increase in hardenability resulted when copper was raised to one per cent or higher. Thus, it was observed, that when copper is unusually high in scrap it can be used as a partial substitute for some other alloying elements in applications where hardenability is a major factor.

Another paper in which copper, the "red queen," plays the prima donna, was presented by N. A. Ziegler and W. L. Meinhart, research metallurgist and assistant research metallurgist, respectively, Research and Development Laboratories, Crane Co., Chicago. These investigators tackled the problem of increasing the weldability of low carbon molybdenum steels of the type commonly used for making castings for high temperature superheated steam service. The molybdenum content is fixed by the requirement of high temperature creep resistance. By decreasing the carbon content, weldability of the steel is improved, but its tensile strength and yield point values are lowered below those specified. This posed a problem of reducing the carbon, thus improving the weldability, and discovery of some alloying element which would develop desired physical properties while holding its detrimental effect on weldability to a minimum. Copper in amounts of 0.5 to 1.5 per cent seemed a promising candidate and the investigation accordingly revolved around such additions.

It was found that increase in copper from 0 to 1.5 per cent, with other chemical ingredients constant, might almost double strength while causing only unobjectionable increases in hardness, decreases in ductility and decreases in impact resistance.

Addition of one per cent copper to a steel containing a maximum of 0.1 per cent carbon and 0.5 per cent molybdenum developed in the resultant product, after suitable heat treatment, properties required from a cast carbon molybdenum steel, containing about 0.25 per cent carbon. Dilatometric analysis and micro examination proved such steel less thermally sluggish and air hardenable than regular carbon molybdenum steel, and thus more weldable, than regular carbon molybdenum steel in which a higher carbon content is specified in order to develop desired physical properties. Welding experiments and hardness distribution studies over the weld and affected zone showed that maximum hardness thus developed in these and similar compositions to be considerably lower than in conventional carbon molybdenum steel.

Raising the copper content from 0.1 per cent (max.) to 0.2 per cent (max.) produced physical properties comparable to those of chromium molybdenum steels, notorious for their thermal sluggishness and air hardenability. These copper bearing specimens, however, provided the blessing without the curse, dilatometric analysis, micro examination and welding experiments showed, for the specimens tested proved less thermally sluggish and air hardenable than even conventional cast carbon molybdenum steel.

o o o

Controlled Rapid Thermal Dissipation To Obtain Progressive Solidification

IN a paper dealing with controlled rapid dissipation of heat, Henry F. Hagemeyer, Castings Patent Corp., Chicago, favored rapid cooling of metal and controlled direction of heat dissipation, or, in other words, controlled progressive solidification. He stated that because of the extreme rapidity of solidification under current practices, however, the degree of accuracy of controls that can be incorporated in such practices are limited. However, methods being developed utilize materials in the cavity for receiving the molten metal with a low heat absorbing and transfer rate, making possible the introduction of means to remove heat of metal at proper points in a given design, so that heat dissipation can be more readily controlled.

In considering the thermodynamic approach to controlled progressive solidification through directional rapid thermal dissipation, the author mentioned some points that he has presented in the past, along with some further items. These are noted as a basis for discussion the thermodynamic problems involved, and in this way all factors involved in producing a cast product of maximum physical and mechanical properties are covered. The listing includes 16 factors that must be considered to produce castings possessing such properties.

Under the classification of Mold Material Considerations, the author listed five points. In the forming of liquid metal into a desired solid shape or form, the conversion method should incorporate a mold material which: (1) Yields to the contracting alloy; (2) is gas free; (3) possesses uniform venting properties; (4) can be vented artificially and (5) is strong enough to resist a desired hydrostatic head.

The mold material must be strong enough to hold its shape against the force necessary to put the metal into place in the cavity, but be weak enough to yield before the contracting stresses as the metal goes from the liquid to the solid stage. No gas forming materials can be present, so as to prevent bubbling or agitation that would cause turbulence when the metal is poured. A material with uniform venting properties over the cavity surface and behind the face of the cavity will permit the metal to lay intimately against the walls. Such a material should also allow proper vents to be placed where the metal is required to flow more readily, such as in thin sections in the cavity. Also, a mold material must be strong enough to resist the pressure generated by a definite, predetermined hydrostatic head sufficient to completely expand a molten alloy of either high or low viscosity into the cavity and to reproduce the most minute details in the cavity.

Gating and Risering Considerations include (6) dress elimination; (7) uniform gate pressure; (8) metal introduction into the cavity and (9) central position of product to the cavity after shrinkage. Pressure should be the same at all points in a mold containing a number of cavities, and metal should be able to enter the cavity provided for it at the bottom so there is no turbulence or so little turbulence that the metal surface will be unbroken as the metal expands into the cavity. This prevents "lapping" or entrainment of the surface envelope or parts of it in the

body of the metal while it fills the cavity. The arrangement, size, and shape of gates and the design of blind risers must be so that the product will remain central to the cavity that it occupies and will not be subject to distortion or deformation by the subsequent shrinking of gates and risers.

Locations of Cavities in the mold is the third main phase of the paper, and the author points out that where mass production from mutiple cavities in the mold is required, (10) all cavities must be in the same horizontal plane so that they are subject to the same hydrostatic pressure.

Four factors influence Solidification Considerations. These are: (11) Control of solidification direction; (12) rate of solidification; (13) balanced heat dissipation; and (14) equalization of solidification. To control the direction of solidification with respect to the proportions of the various sections of a design, a center of contraction located on the center line of each section must be created so molten metal will begin to solidify from such centers toward the outer portion of the sections and on a line toward risers. The solidification rate from such centers should be as rapid as possible so that minimum grain size is obtained.

Mold Cooling possibilities are influenced by (15) fixed thermal conditions surrounding the cavity for the metal. Material around each cavity must be of uniform and definite dryness and at a predetermined temperature. If coolants are used in the mold to control direction or rate of solidification, such coolants should flow at a definite temperature and rate before the metal is expanded into the cavity and should circulate until a definite, predetermined temperature is obtained in the product after solidification.

As to the Mechanical Considerations, in any ideal process for forming liquid metal into a desired solid shape or form, all physical factors of the process should be (16) mechanically instead of manually controlled.

The problem of directionally controlled rapid thermal dissipation to obtain progressive solidification, from a thermodynamic point of view, is divided into three parts, as follows:

1—In a mold cavity filled with liquid metal, every crystal in the mass must be in a declining temperature relation to the initially solidified crystal and solidification must be progressive from this point in a constantly enlarging encircling zone to the limits of the minimum diameter of the part and from, following a line of heat intensity to the feeders, risers, or shrink bobs.

2—In forming liquid metal into a desired form, the conversion method should incorporate a means to create a center of contraction either in the mass or contour of the shape.

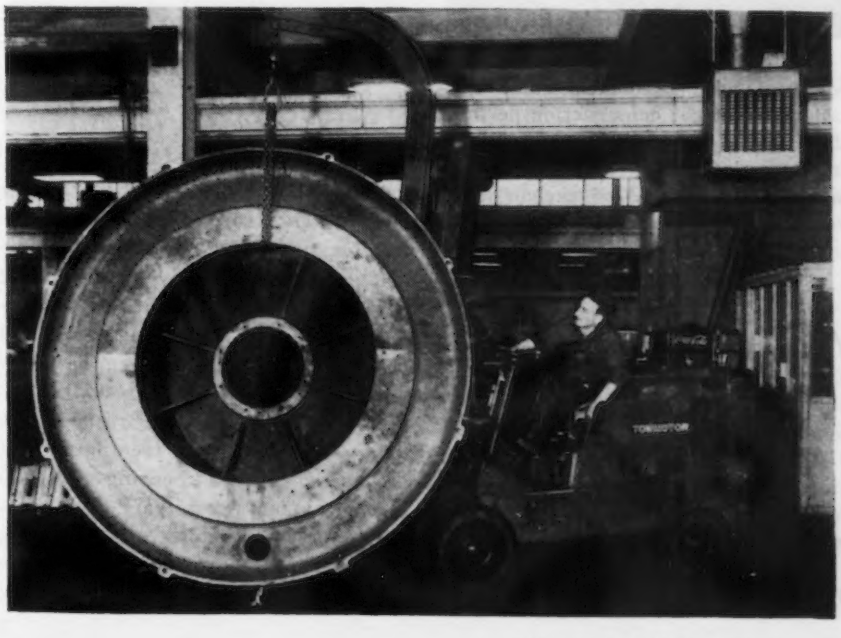
3—In forming liquid metal into a desired solid shape, the conversion method should incorporate the means to create a controlled condition of compression, rather than a state of tension, around a center of contraction either in the mass or contour of the shape.

From the abstract point of view the control of solidification demands that a center of declining thermal intensity from the feeder (riser) or adjacent section, to the ultimate end of a section or design, travel on a definite, predetermined path to the end of the section or design, and then retrace this line of thermal intensity, so that the compressive stresses developed around the center of contraction will converge back to the feeder. Further, the hydraulic and pneumatic conditions existing in the mold cavity, as controlled by permeability of the mold material and necessary direct venting to the atmosphere (the necessity of the latter being determined primarily by the contour and mass of the cavity) must be such that the flow of metal into the mold cavity will develop the minimum variation in level of metal in the cavity. Under these conditions, regarding the mold cavity and the introduction of liquid metal into it, consistent expansion of the metal into the cavity will be obtained and the entrainment of any film from the surface of the metal which has been exposed to the atmosphere of the cavity will be avoided.

Furthermore, the design of the mold cavity must be such that the inlet for the liquid metal will be at the bottom of the cavity, so that the continuous expansion of the liquid metal into the cavity can be throughout the entire cubicle content of the cavity, when contour and mass of the design make this possible.

The last three items, although not referring to heat dissipation, are important because the entire volume of liquid metal expanding into the mold cavity must pass through the gate inlet. This means that the gate area will be exposed to a much larger amount of heat than any other section of the cavity. The fact that all the metal eventually contained in the mold cavity must pass this gate area means that the mold material forming that area will be heated to a higher degree than any other point in the cavity. Consequently, the hydraulic and pneumatic means used and the time and rate of passage of the liquid metal through the gate area and its controlled, directed path through the cavity, are important in the problem of properly directing the dissipation of heat from the metal shape.

SPECIAL ARM ON LIFT TRUCK: In the plant of the Cleveland Hobbing Machine Co., Cleveland, large objects are easily handled by a standard Towmotor Fork Lift Truck equipped with a crane arm and hook attachment.

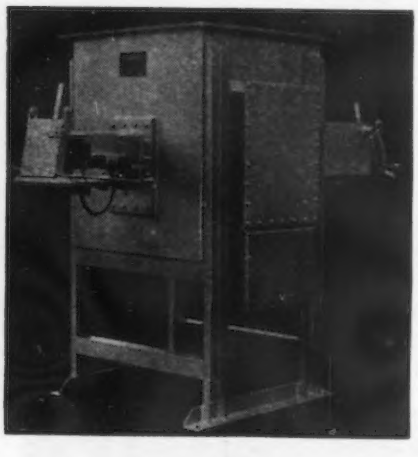


New Equipment . . .

Heat Treating and Process Control

Recent developments in induction heating equipment, heat treating furnaces, process control and analyzing instruments are described and illustrated in the following pages.

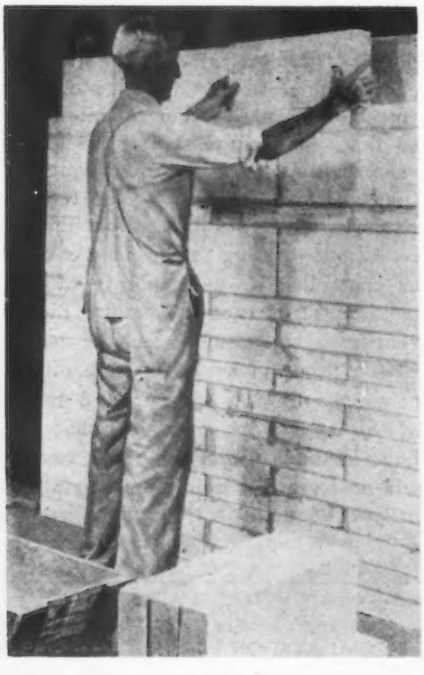
A LINE of high temperature electric furnaces for sintering powdered metal at temperatures between 1800 and 2750 deg. F. is announced by the *Harper Electric Furnace Corp.*, Niagara Falls, N. Y. They are equipped with a preheat tunnel leading to the high temperature chamber and a water-jacketed cooling chamber. The entrance to the preheat tunnel and the exit on the cooling tunnel are



equipped with automatic flame curtains. Gas-tight construction permits the use of protective atmospheres such as hydrogen, dissociated ammonia and mixtures of carbon monoxide, hydrogen and nitrogen.

Insulating Fireblock

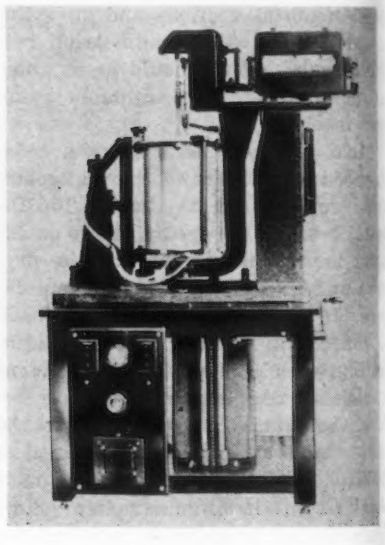
ANNOUNCEMENT has been made by *Johns Mansville Corp.*, 22 East 40th Street, New York, of a new insulating Fireblok. Similar in composition and properties to the J-M insulating fire brick, it is suitable for the same range of temperature conditions, but comes in much larger sizes. It is manufactured in sizes 9 x 24, 9 x 12, 4½ x 24 and 4½ x 12 in. Standard thicknesses



are 2½, 3 and 4½ in., with special sizes and thicknesses available. Temperature ranges are from 1600 deg. F. for grade JM1620 up to 2600 deg. F. for grade JM-26.

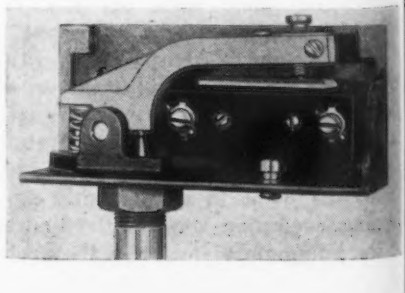
Dilatometer

A DIRECT-READING dilatometer which records temperature-dilation changes and temperature-time changes simultaneously in ink during heating and cooling cycles of ferrous and non-ferrous metals, ceramics and other materials in solid form has been produced by the *Bristol Co.*, Waterbury, Conn. The two records are made on a chart with rectangular coordinates. The ball bearing multiplying mechanism exerts very light pressure on the sample and provides smooth accurate records of the temperature-dilation of the sample. The split furnace, which is designed for temperatures to 2500 deg. F., can be pulled away from the sample for quenching or cooling without disturbing the record. The inside dimensions allow the use of any size or shape of sample up to 1⅝ in. diameter by 5 in. long.



Control Switch

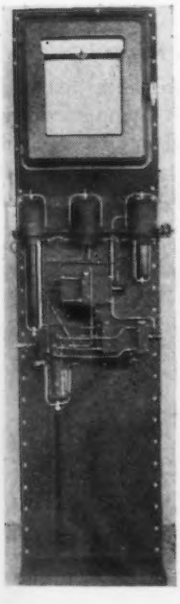
THE Model H temperature limit switch is available from the *Burling Instrument Co.*, 253 Springfield Avenue, Newark, N. J., with switch normally closed for cutting off heat, stopping fan or closing valve; with switch normally open for light-



ing lamp or ringing bell; or with single pole double throw switch for breaking a heating circuit while closing an alarm circuit. A reset button operates from outside of case. Snap action micro-switch eliminates contact troubles. Range is between 0 to 1400 deg. F.

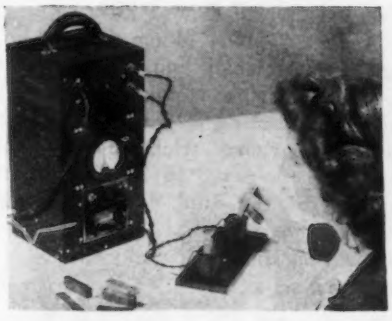
Gas Analyzer

THE 4-point gas analyzer introduced by *Cambridge Instrument Co., Inc.*, Grand Central Terminal, New York, provides simultaneous analysis and continuous graphic record of the amounts of oxygen, carbon dioxide, carbon monoxide and hydrogen in a sample of combustion products. Chemicals, fragile glassware and moving parts in the analyses unit are eliminated. Analysis is accomplished by direct comparison of thermal conductivity of the sample with that of a reference gas or by comparison of thermal conductivity of the sample before and after chemical absorption or combustion. The recorder is automatically connected to the circuit of each analysis cell in succession, the duration of each connection being 1 min. A continuous record is provided on a 10 in. strip chart and the four different registrations are shown by different colors and numbers on the chart.



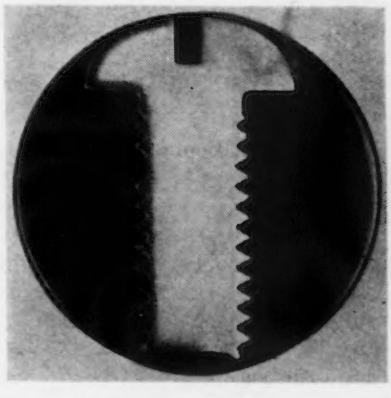
Magnetic Comparator

A MAGNETIC comparator for controlling the quality of ferrous parts of the same size and shape has been announced by the *General Electric Co., Schenectady*. When the part to be tested is placed in a coil which has been balanced electrically against a standard part, the comparator detects any difference in the two parts which changes the magnetic flux linking the coils surrounding them. The difference is shown as unbalance on the indicating instrument, which reads within passing limits when the tested part is acceptable. The comparator is said to be sufficiently sensitive to distinguish between samples whose hardness varies as little as two points Rockwell.



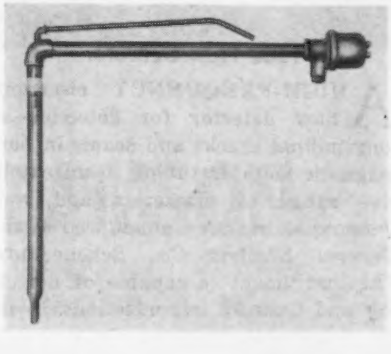
Stop-Off Paint

A STOP-OFF paint for selective carburization on steel parts in liquid carburizing baths has been developed by the *Park Chemical Co.*, Military at Bourg Street, Detroit 4. Applied as a paint, No-Kase is confined to the area where protection is desired and within an hour is sufficiently dry for immersion in the carburizing bath. The heat of the bath burns out the vehicle of No-Kase paint and leaves the pigment as a continuous metallic coating, which may be brushed off after carburizing and quenching.



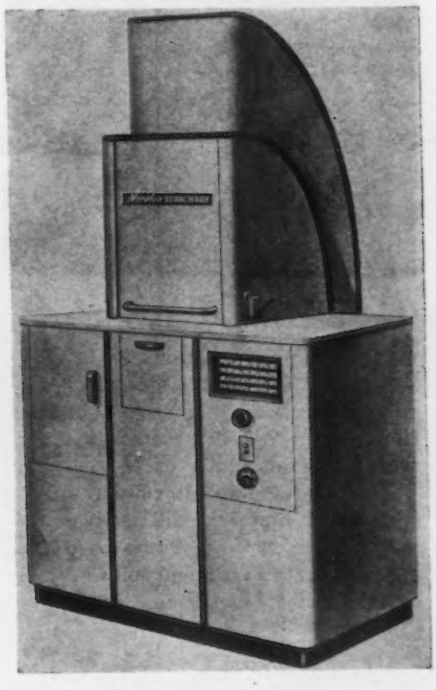
Vent-Type Thermocouple

A VENT-TYPE thermocouple for use in liquid bath furnaces, developed by the *Claud S. Gordon Co.*, 3000 South Wallace Street, Chicago, has a vent at the top which permits the gas to escape and, by artificial circulation, admits the right amount of pure air to take its place. An air connection may be made with the blower and a small amount of air may be circulated through the tube. It is claimed that the life and efficiency of the thermocouple is increased two or three times by the use of the vent type.



X-Ray Unit

THE Norelco Searchray Model 150 is announced by *North American Phillips Co., Inc.*, 100 East 42nd Street, New York. It is designed for inspection of parts, assemblies and finished products of metal, hard rubber, plastic, bakelite, ceramics, dielectric materials, etc. It makes possible the taking of sharp radiographs quickly by plant personnel under controlled conditions, without the expense of a skilled X-ray technician or the cost of a lead-lined room. Generator capacity is 150 kv. A fluorscopic screen and mirror aids in positioning the object before the film is exposed.



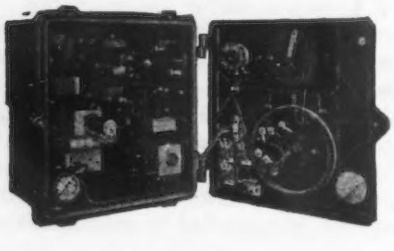
Sulfur Determinator

AN instrument for rapid and accurate sulfur determination of steel, iron, non-ferrous metals and materials such as coal and coke has been announced by the *Harry W. Dietert Co.*, 9339 Roselawn Avenue, Detroit 4. The sample is ignited in a high temperature furnace in an oxygen atmosphere and the sulfur in the sample is converted to sulfur dioxide

gas. It is filtered free of all dust particles by a hot ceramic filter within the furnace combustion tube. The sulfur dioxide gas then bubbles through an alkaline solution which reduces the alkalinity of the solution. The greater the sulfur content in the sample, the lower the alkalinity of the solution, which is measured by titrating with a standard acid solution. The determination is made in 3 min.

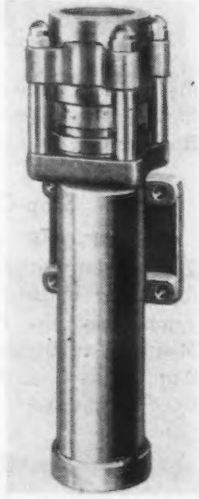
Pneumatic Controller

THE Celectray pneumatic indicating controller developed by the *C. J. Tagliabue Mfg. Co.*, 550 Park Avenue, Brooklyn 5, does not employ a motor or other continuously moving parts. Other features include continuous action, no measurable dead zone, high sensitivity and adjustment to very low sensitivity, no mechanical connection between galvanometer and pneumatic circuit and simple lead error. A magnetic air-valve acts as an amplifier and converter from electric to pneumatic operation.



Fluid Flow Gage

A PRECISION Flogage, which continuously indicates the rate of fluid flow, is announced by *Hydraulic Machinery, Inc.*, 12825 Ford Road, Dearborn, Mich. The indicating dial is actuated by the kinetic energy of the fluid flowing through the gage. The indicating dial is constructed as an impeller, the rotary movement of which is resisted by a precision torsion bar. It is insensitive to changes in fluid viscosity, temperature or pressure, is accurate to within a fraction of a per cent and can be constructed to withstand any internal pressure without affecting its accuracy.

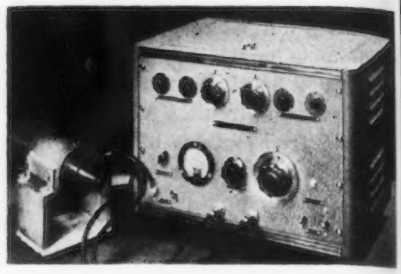


Micro-Positioner for Valves

A MICRO-POSITIONER for pneumatic motor valves, used to insure precise and dependable valve response, especially where operating conditions may make the response uncertain, slow or unsatisfactory, is featured by the *Foxboro Co.*, Foxboro, Mass. The vernier Valvacator is actuated by air pressure changes as slight as the equivalent of ½ in. of water and can compel valve stem movements as small as 1/1000 in. Flexure type bearings, in place of pivots, eliminate the effects of mechanical vibration without loss of sensitivity.

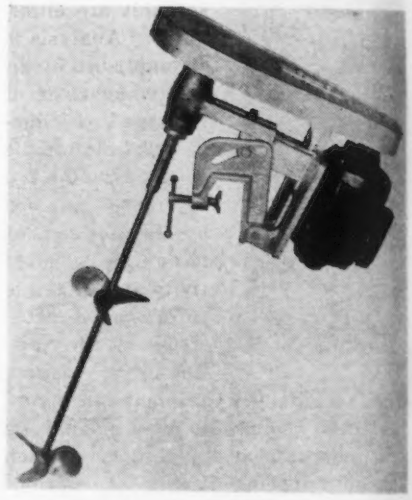
Tube Flaw Detector

A HIGH-FREQUENCY electronic flaw detector for detection of longitudinal cracks and seams in nonmagnetic metallic tubing in an extensive range of diameters and wall thicknesses has been announced by the *General Electric Co.*, Schenectady. The instrument is capable of detecting and locating imperfections ½ in. long, 10 mils wide and one-third of the wall thickness in depth, even though they are on the inside of the tubing and do not appear on either surface. It is especially desirable for testing tubing for coolers and heat exchangers before installation, thus preventing flaw failures in the field.



Portable Mixer

A BELT-TYPE portable industrial mixer, in which the motor hangs outside the tank and out of the path of destructive mixing fumes, is the development of *United Electric Motor Co.*, 178 Centre Street, New York. Designed so that the balanced hanger carries the weight of the unit below the center of gravity, the mixer needs no tension on the clamp to hold it in place. Operating on either a.c. or d.c., precise speeds are obtained by simple pulley changes.



Foundry Ladle

MANY of the features heretofore associated with large ladles are now available on smaller sizes, the *Whiting Corp.*, Harvey, Ill., announces. The insulated cover of a small ladle swings horizontally to open. Improved trunnion bearings and a safety gear bracket for tilting are provided. A 3 in. lining keeps metal hot with less chance of cooling. It is available in various sizes, 22 in. diameter by 22 in. deep being typical.

THE FORBIDDEN ROOM...

There are only six keys to the door, and the lock is often changed. . . . For this is a very private room. It is in the plant of one of America's greatest corporations, and behind the door to this inner sanctum part of the future is being made.

There are literally hundreds of "forbidden rooms" in America today, where the plans, the designs, the mock-ups and models are being made for countless new products and machines—from giant electrical power plants, still in the experimental stage, to table-model television sets, now a solid post-war certainty.

Few outsiders ever enter this inner circle . . . but one of these is the machine tool engineer.

For equally as important today as any brilliant new design is the *cost of manufacture*—and it is here that the machine tool engineer comes in. Leading manufacturing executives know that this factor of cost is going to be more important, in the fast competition of the post-war period, than ever before in history.

It is because of this that Jones & Lamson engineers are being taken into their conferences and their confidences: helping them to plan complete production line set-ups for the day this war ends.

Even more important than the machine tools your company uses is the machine tool engineering that goes with the use of those tools!

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

Profit-producing Machine Tools

Assembly Line . . . STANLEY H. BRAMS

• General Motors tells machine tool makers what its maintenance problems are . . . Ten engineering preferences are listed for machines . . . New electric standard outlined by G.M.

DETROIT—Machine tool maintenance problems and how to overcome them provided material last week for a most unusual conference between standards men, engineers and master mechanics of General Motors Corp. and about 175 machine company executives and engineers.

The session was a shirt-sleeve affair, at which servicing obstacles and objectives were presented by the General Motors men, followed by down-to-earth discussions between those buyers and specifiers of equipment and their suppliers. Machine tool people in attendance—and some of the biggest names in the country were there they were generally enthusiastic over the value of the meeting, and hoped there would be others.

Although the theme of the meeting was maintenance and service problems, there were significant notes sounded on what General Motors seeks in performance, and how its postwar program may influence machine tool business.

O. E. Hunt, vice-president in charge of G.M. engineering, told a dinner meeting that his company looks upon many of its prewar tools as "junk" by today's standards. He indicated that orders covering reconversion needs will have to be placed for perhaps 10,000 machine tools. Many will be placed in the next 90 days, he said, bolstering an already formidable batch already put on tool company books to assure priority when production is authorized.

This optimistic word was accompanied by a provocative speech by J. Y. Scott, president of the National Machine Tool Builders Association. Scott pointed out that American machine tools have been exported to the world, giving other nations the production advantages formerly enjoyed exclusively by the United States. He said it was now up to the machine tool builders to provide better equipment than ever before, to continue the advantage of the United States in the world production race.

MACHINE tool makers found ten guide posts set up for them along their design and engineering road by H. T. Johnson, G.M. director of standards. Johnson, credited on all sides for the success of the meeting, gave the corporation's answers to the questions he said were most frequently asked of him by machine tool men. These were the topics:

1. *Standardization.* G.M. feels there should be much more standardization of machine tool elements—electric controls, pushbuttons, sizes of screws and bolts, leveling methods, etc. He suggested that model designations, rather than arbitrary numbers of letters, be standardized in the trade to indicate capacities.

2. *Feeds and Speeds.* These should be increased, in line with latest techniques.

3. *Type of Feeds.* The tendency in General Motors is to edge away from hydraulic feeds toward mechanical feeds, simply because hydraulic feeds are so designed into the machines that servicing and maintenance is extremely difficult.

4. *Electric Controls.* Full electric controls are urged if accessible and durable.

5. *Finishes.* Emergency finishes are unsatisfactory, because they are hard to keep clean. The earliest possible return to prewar finishes, probably in lighter tones, is recommended. Some divisions favor painting work areas very light as a safety measure.

6. *Capability of Machines.* More rugged machines, more solidly based, are deemed necessary to permit operation at higher speeds and retention of earlier quality of finish and accuracy. (Other speeches indicated that G.M. may be thinking, however, that some of its prewar insistence on quality may have been slightly overdone, and that less rigid tolerances may be specified without any impairment of quality.)

7. *Chip Disposal.* There is much criticism of machines in G.M. on this score and it is felt that a big field for improvement exists and is, in fact, necessitated by faster machining.

8. *Lubrication Facilities.* The ultimate aim should be to provide automatic lubrication for every bearing in a machine.

9. *Hardened and Ground Ways.* They are most desirable, but they must be provided so that they can be serviced in the plant of use on a standard surface grinder, rather than on special equipment elsewhere.

10. *Electronic Controls.* They are desirable. But trained maintenance personnel must service them, creating special problems; and manufacturers should provide all available information on maintenance. Standardization should help.

Such were the answers of the nation's largest machine tool buyer group for basic concerns of the equipment makers. Beyond that, however, General Motors had a sizable bill of maintenance particulars for the machine men.

A MOVIE and a series of slides demonstrated the commonest problems of maintenance within G.M. plants. Shots were shown of machines whose motors were so inaccessible as to make their removal a lengthy, arduous job. Others had their electric control panels badly placed—near the floor, for instance, where oil seeped into them. Others had pushbutton controls located where the operator had to reach for them past moving parts, creating a safety hazard. Others by their nature splashed oil or chips.

Many of these examples had companion photographs at hand, showing how company maintenance men had relocated switches or panels or motors to make the machine more efficient.

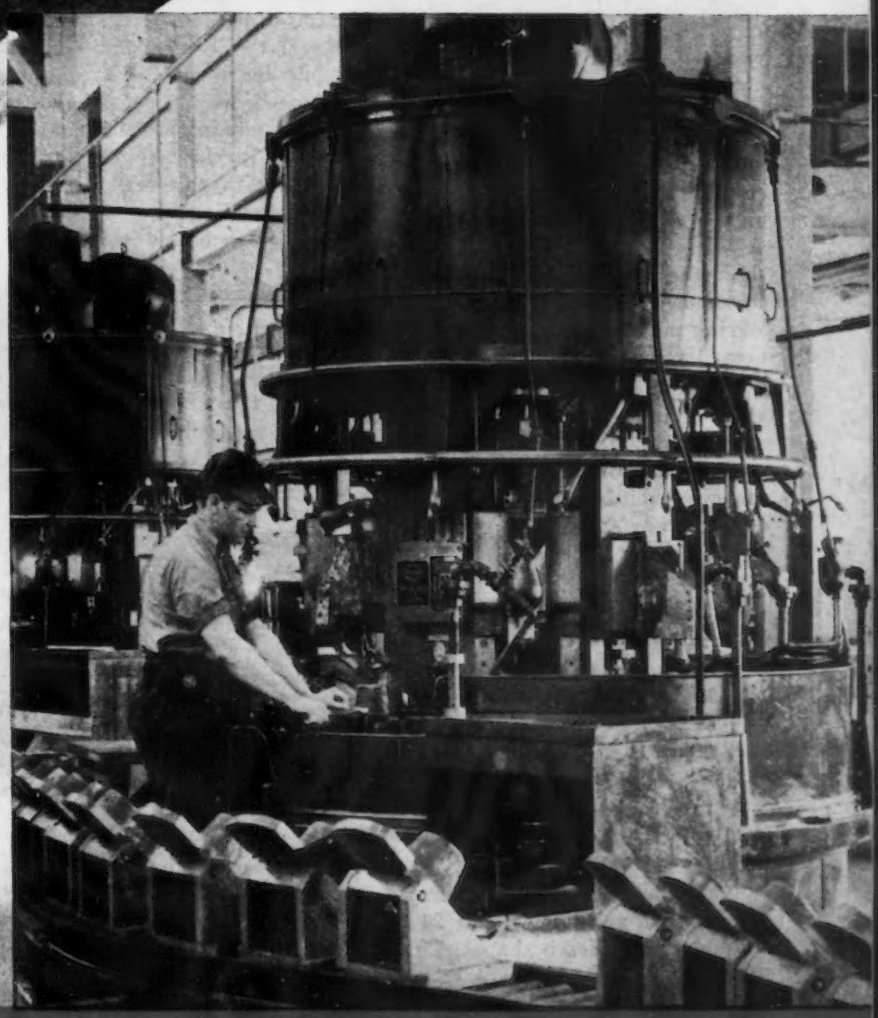
On the electrical score, General Motors employed the meeting to introduce a proposed new set of machine tool electrical standards. They represent the cumulative thinking of all G.M. divisions, and will be discussed by the electrical committee of the Machine Tool Builders Association. They involve several changes from the comparative war standards of the Ameri-

The two Bullard Mult-Au-Matics you see here are keeping that conveyor filled with parts for aviation engine crankshafts. It takes a lot of crankshafts for America's current output of more than 10,000 motors per month.

Since each Mult-Au-Matic processes 8 parts simultaneously, it materially lowers production time on scores of precision jobs like this. That's *one* big reason for its widespread use today. Another, equally important, is that the Mult-Au-Matics are readily adaptable. Long after the engines of war have finished their task, the Mult-Au-Matics that built them will be hard at work, lowering costs by increasing output on the host of new comforts and necessities we shall need in a world at peace.

CRANKSHAFTS

Coming up!



BULLARD

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

can Standards Association, including possible changes in symbols, a subject to be discussed later.

The new G.M. standards require machine tool builders to furnish and mount a Type A disconnect switch or circuit breaker on their equipment. Terminals will be required for solenoid coils and starter coils, to relieve service problems. Protection against overtravel must be furnished for limit switches, as an accident prevention measure. Semi-dust tight enclosures are specified for controls. No openings between a motor compartment and any other compartment are permitted in the standard; motor compartments must be vented direct to the atmosphere, at a point high enough above the floor for protection against entry of dirt, chips, etc. Control panels must be mounted at least two feet above the floor, to eliminate damage from industrial trucks. Combination starters are urged, to cut down the number of boxes on a machine.

All AC motors up to and including 1½ hp., 1800 RPM, are to be fully enclosed, ball bearing, solid frame, not fan cooled. Larger motors must be fan cooled. All motors are to be 220/440 volt, unless specified otherwise. To facilitate servicing and increase flexibility, all motor compartments must be of sufficient size to accommodate a unit one size larger than the maximum horsepower recommended by the machine tool builder. Wiring may be insulated with an approved varnished cambric.

All start buttons are to be mounted above or to the left of their associated stop buttons. This requirement is expected to eliminate the need of occasional habit-breaking when an operator is transferred from one machine to another.

G.M. has also set up other standards, now in completion stages, which bear on machine tool specifications. A grinding wheel standard providing 11 standard hole sizes is to be submitted. The hole sizes, in inches, are: ⅛, ¼, ⅜, ⅝, ⅞, 1¼, 2, 3, 5, 12 and 20. Twenty-one sizes are now provided in the simplified practice of the Grinding Wheel Manufacturers Association.

A standard also is on the way for carbide tips, providing about 24 sizes and less than a dozen shapes. Thicker sizes are eliminated. Shank specifications for thickness, widths and lengths are unchanged, however, from the standards of the carbide manufacturers.

Labor Asks Guaranteed Wage, 30-Hr. Week in Automotive Industry

Washington

• • • **Leaders of** organized labor met with WPB executives on April 27 and submitted recommendations for: (1) Socialization of the automobile industry; (2) interim steps to be followed before reconversion of the automotive industry; and (3) a program of auxiliary employment embracing immediate reconversion.

Labor men who make up the Automobile Labor Advisory Committee asked for a guaranteed minimum weekly wage, and a 30-hr. week after the war as a means of meeting the employment problems of the automobile industry. Automobile industry officials have said that the seasonal character of the industry cannot be changed unless the government orders 100 per cent production in peacetime, and purchases and distributes excess output not absorbed by natural buying demand.

If the government did not do this, but did establish the minimum guaranteed weekly wage and the 30-hr. week, union contracts running into the peace period would force the companies to pay workmen when plants are standing idle. Of course, as William Green and other labor leaders have said, the union demand for a 30-hr. week does not mean labor is asking for less pay, but the same or more pay for fewer hours of work. One WPB official pointed out that WPB has no legislative authority, and such matters are up to Congress.

Industry in general has adopted the position that the social security sought by the unions to protect workers when war contracts expire should come through increased state unemployment compensation, possibly with federal assistance rather than guaranteed weekly or annual wages, or dismissal pay.

The second series of recommendations made by the Committee, having to do with preservation and maintenance of the nation's transportation were:

1. Relaxation of WPB "L" orders on spare parts, batteries and garage equipment to insure an adequate supply of repair parts and facilities to keep existing trucks and buses in good repair.
2. The WPB Automotive Division was requested to investigate methods of setting up reconditioning centers in various parts of the country where assembly line methods could be applied to the repair of thousands of automobiles.
3. WPB was requested to investigate the possibility of transforming standby war plants into such reconditioning centers for both military and civilian cars, thus keeping intact the labor force of the plants in case a future resumption of war production is required.
4. The Committee pointed out the need for OPA ceilings on auto repairing and also for used cars; that priorities be given to war workers in the purchase of used cars, etc.
5. Initiation of a program to make civilian trucks and buses to meet essential transportation needs.

The Committee's reconversion ideas were embodied in a third series of proposals:

1. Establishment of an automotive industry council composed of representatives of government, management and labor, to develop plans for reconversion.
2. The Committee emphasized the need for advance information on proposed cut backs.
3. The Committee said it was convinced that the plans for eventual reconversion of the auto industry could not be effectively formulated without parallel discussions with the aircraft industry.
4. The committee favored general immediate resumption of civilian production in tight as well as loose labor areas as soon as justified.
5. Construction of the tools and machinery that will be required for reconversion as tooling capacity develops.
6. Action to speed the disposition of government-owned machinery in plants in the auto industry, including a system by which manufacturers could lease needed machinery, with provision of a purchase negotiation later.

New Line of Motors for Machine Tools Developed

Detroit

• • • **Totally enclosed** fan-cooled motors manufactured by the Delco Products Division of General Motors will be superseded by a new "GM Special" line of machine tool motors. The new motors will not be available in re-rated frames, said C. J. Werner, of Delco. The line will offer longer double shell cast frames with sturdy foot support, oil and water tight junction boxes, and means for re-lubrication and for preventing over-lubrication.

GM and U. S. Steel Will Assist Navy Supply Study

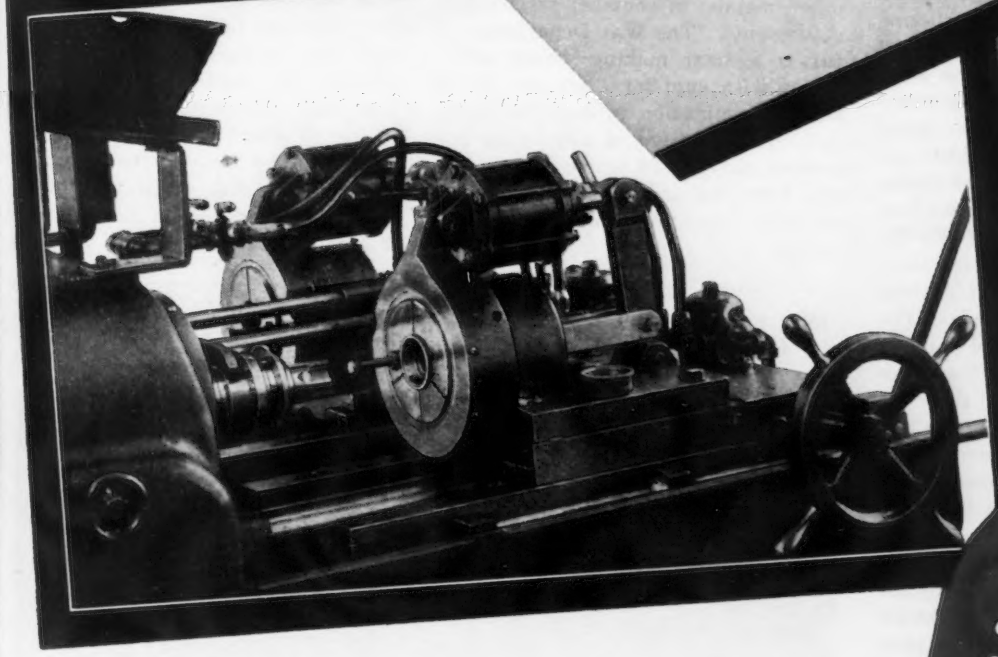
Washington

• • • **To act in an** advisory capacity without compensation, General Motors Corp. and United States Steel Corp. officials at the request of the late Secretary of the Navy, Knox, will assist the Navy in the making of a study designed to improve its methods of handling the vast quantities of material and supplies required for the prosecution of the war by the largest Naval force in the world and thereby increase efficiency in operation.

KEEPING AHEAD OF THE TIMES

MURCHEY

Now Offers Special Applications for No. 22 DOUBLE SPINDLE Tapping Machine



● Sizes and depths of threads for this particular application are as follows: Size 2½ x 11″ Straight Pipe Thread—Depth ⅝″ in C. R. Steel W. D. 1010. Two hundred and fifty pieces per hour on two spindles. No. 22 Double Spindle Tapping Machine is capable of various other applications. Write us your requirements.

MURCHEY MACHINE & TOOL CO.
DEPT. I • DETROIT 26, MICHIGAN

Write also for information on Collapsible Machine Taps; Self-opening Die Heads; Thread Milling; Shell Tapping and Roller Pipe Cutting-off Machines.

MURCHEY

Washington . . .

L. W. MOFFETT

• Steel executives see need for legislation or regulations to take care of financial risks involved in paying for raw materials at the end of the war.

WASHINGTON — Some people in government are predicting that the various government departments arguing about the whys and wherefores of starting reconversion are futilely beating their gums over a matter which will be taken out of their hands as soon as conditions are right for large scale resumption.

Right now, the taking of WPB's troubles to the various Congressional Committees has the result of putting the problem before the people. The Truman Committee has had its say about unduly restricting civilian production and it is expected that the Senate Small Business Committee will come up with a similar recommendation, that nonmilitary production be permitted where it will not interfere with war production.

No one knows whether the Army's reasons for not wanting to see any increased civilian production are based upon a belief that it would be poor psychological warfare, impractical planning, or a desire of the military to dominate the civilian economy as some suggest, or a disregard for the consequences of undue restrictions in the zeal of planning for the biggest war in history. It is certain that the policy carried too far will insure unemployment, and complicate the change-over from war to peace manufacturing.

It is quite apparent that the White House is not interested in seeing immediate increased civilian production and most people close to Washington politics think that the reconversion "go" signal must come from the President himself. A blotting up of unemployment areas just prior to elections and a business resurgence at the same time would promote good feeling.

STEEL men here see a need for legislation or regulations to take care of the financial risks involved in paying for raw materials, including ores in the process of reduction and metal in process of being rolled in the steel mills and the non-ferrous metal industries at the end of the war. Present termination regulations are silent on this subject.

The problem is magnified by the fact that most mills are subcontractors and the largest tonnages are not sold directly to war agencies but to manufacturing consumers. The need for some relief can be seen in the example of the procurement agencies paying both contractors and subcontractors for ordinary work in process and uncut inventories of steel and other metals, in contract termination settlements. The War Department so far is against making direct settlements with suppliers, but may do so before termination procedures finally jell. The question of approving settlement charges of prime contractors who have paid subs for work in process and inventory has never been raised.

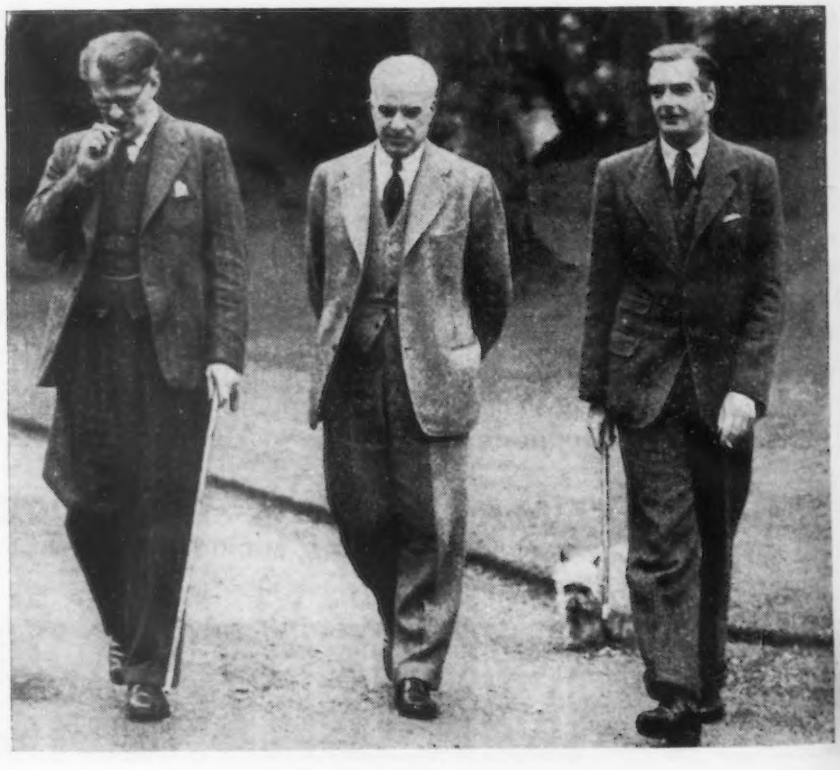
So far, terminations have not seriously affected the operating rate of the steel industry, but if either war should end suddenly it would. Most suggestions are that any new legislation on termination should include provision for the government to assume financial risk only in the case of plants built with DPC funds.

* * *

• **The uniform** steel price escalator clause put out by the WBP Procurement Policy Board on March 1 has been withdrawn at the insistence of the steel industry, WPB officials say. The clause which would have brought all open end and long term steel contracts under the War Department's close pricing policy may be revived later, War Department officials say.

The clause now in use ties steel prices to OPA ceilings, which the industry favors and the War Department objects to, on the ground that OPA ceilings are established on a base broad enough to adequately compensate the highest cost producer. The War Department feels that it should be able to negotiate with companies on the basis of the companies' efficiency so that costs will be low after the Renegotiation Act passes out of existence at the end of this year,

INFORMAL CHAT: *Edward R. Stettinius, center, walks with Richard Law, left, and Anthony Eden, right, during a recent week end at a country mansion in England. According to press accounts, the Stettinius trip was a success.*

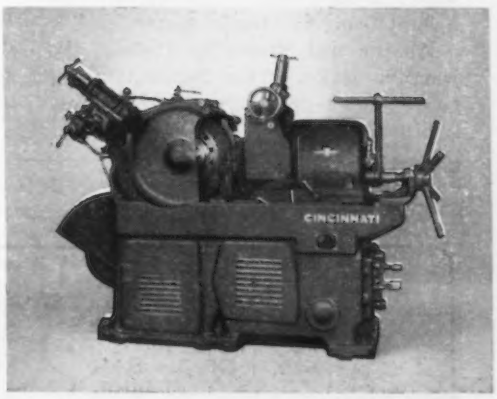


Special Infeed Work Rest with hold-down roller arrangement for offset centerless grinding. The machine is a CINCINNATI No. 2 Centerless.

★offset CENTERLESS GRINDING

ANOTHER EXAMPLE OF CINCINNATI CENTERLESS KNOW-HOW!

To handle parts requiring an *"offset" grinding operation, this CINCINNATI No. 2 Centerless is equipped with a special 8" Infeed Work Rest featuring hand ejector, spring pressure hold-down rollers, two work blades and retracting end stop. The machine is also equipped with Hydraulic Profile Truing Attachment over the grinding and regulating wheels. ¶ When offset parts are centerless ground, this setup has two advantages: 1) The hold-down roller presses the part against the regulating wheel, maintaining contact and increasing the driving force. 2) It prevents any tendency of the part to cock between the wheels because of the grinding pressure being concentrated at one end. ¶ If your present operations or future plans call for grinding a wide variety of parts in various sizes, shapes or weights, metals or metal substitutes, the engineers here at Grinding Headquarters will be glad to discuss CINCINNATI grinding equipment with you. Or if you have any problem involving either centerless or centertype grinding, you will be wise to depend upon the know-how of CINCINNATI engineers.



CINCINNATI No. 2 Centerless Grinding Machine. Catalog G-456-1 gives complete details and specifications. Copy will be sent on request. For a brief description of all CINCINNATI Grinding Machines, look in Sweet's Catalog File for Mechanical Industries.

*"Offset" grinding on a CINCINNATI Centerless Machine means that the grinding wheel merely grinds a narrow section at one end of the part. The greater portion, or the entire length of the part, contacts the regulating wheel to assure adequate driving force.

CINCINNATI

CINCINNATI GRINDERS INCORPORATED CINCINNATI, 9 OHIO, U.S.A.

CENTERTYPE GRINDING MACHINES . . . CENTERLESS GRINDING MACHINES . . . CENTERLESS LAPPING MACHINES

and there will be no need for renegotiation.

* * *

• **The War Department** has a new way of determining military requirements. Supplies are being cut back to the production cycle. For instance, if it takes three months to produce a gun, then the Chief of Staff decision on how many guns are needed currently is translated into a three-month supply. Some production cycles are as low as 60 days; others are a year and a half, and military supplies are governed accordingly.

On the other hand, the Department is making an effort to utilize its own surpluses, both new and used, wherever possible through clearance of all material requests through channels of ASF. This should cut down excessive ordering and conserve manpower, materials and plant capacity.

* * *

• **The steel union's** demand of social legislation via WLB directive on the matter of the guaranteed annual wage and the insurance scheme, the elimination of geographical differentials, and industry-wide collective bargaining is headed for the stiffest kind of a fight from the steel industry.

As the war draws to a close, the coercive action of the Board is going to be under greater and greater attack in the courts. It will be seen that the closed shop and check-off issues will get to the Supreme Court notwithstanding the doubt of most steel company lawyers that the Court will uphold settled law by striking down these and similar union grabs for power over management.

If the Supreme Court continues to upset settled interpretations of the constitution, the doctrine will grow up that it is a part of the American theory of government to get a "mandate" from the people and by changing the court change all of the law built up by the previous decisions of courts under prior administrations. Court packing like "the spoils" system will become the nadir of the political "out" ambition, and frustrated demands for a return to old time interpretation of the law will be satisfied differently every time this country has a new President.

Bethlehem's Steel Shipments Set Record

• • • **Bethlehem Steel Corp.'s** rolled and finished steel shipments set a record at 2,402,217 tons in the first quarter of this year, according to E. G. Grace, president. The tonnage was 91,000 tons ahead of the previous high, registered in third quarter last year. (Earnings are reported on page 102).

Mr. Grace stated that his company has been giving consideration to the establishment of manufacturing facilities abroad but he declined to give details. Of $42,000,000 still to be spent in construction, about $35,000,000 will be used in developing Venezuelan ore properties and building new ore carriers.

Bethlehem's order backlog of $2,109,000,000 on Jan. 1 this year had declined to $1,663,000,000 on April 1 due to rearrangement of shipbuilding schedules, etc.

Commenting on the steel wage case, Mr. Grace asserted that in January, 1941, average weekly earnings of his steelworkers were $34.11, against $52.36 in January, 1944. The steel wage demands would cost Bethlehem $50,000,000 per year, he said, not including the guaranteed wage demand. He cited the following payroll statistics:

	1st Quarter, 1944	4th Quarter, 1943
Av. No. workers...	282,969	294,120
Total payroll	$222,749,000	$241,638,579
Av. hr. earnings...	$1.338	$1.377
Av. hr. per wk.....	45.2	45.4
Overtime payments.	$24,631,500	$30,608,245

THE BULL OF THE WOODS — BY J. R. WILLIAMS

Mystic Blows in Its Everett, Mass., Furnace

• • • **The Everett, Mass.,** blast furnace of Mystic Iron Works was blown in on April 25. It had been banked on Feb. 20, because of a pinch in domestic coke supply. The furnace is supplied with fuel by the adjacent New England Coke Co. The coke company's main product is domestic coke. The general domestic fuel situation, including oil, has improved sufficiently since Spring arrived, and Mystic management felt justified in renewing pig iron production.

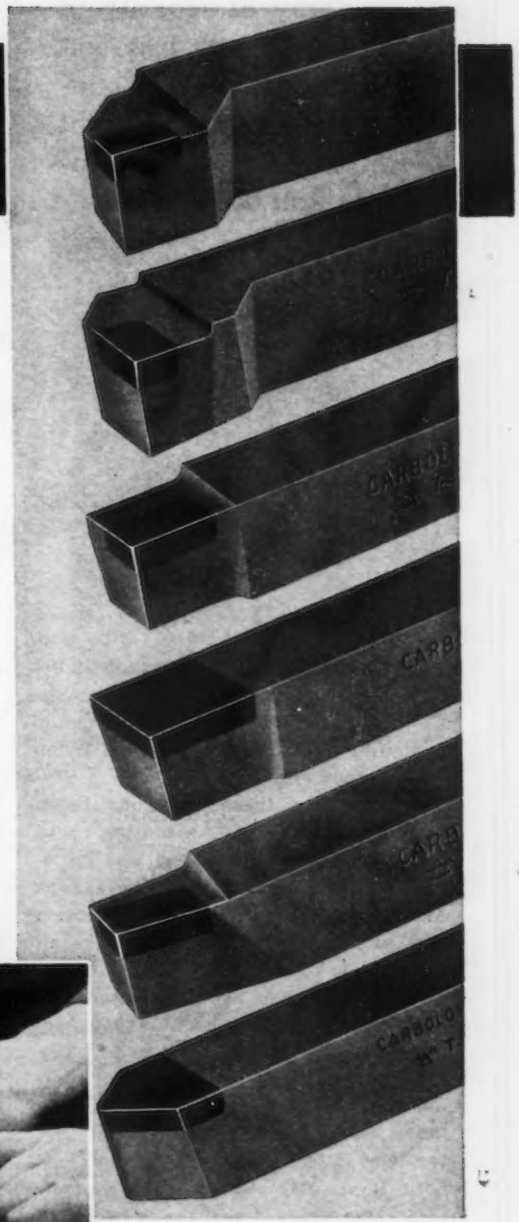
Mystic has sufficient ore on hand to operate at capacity for several months, at least. More ore may be purchased because that on hand is not believed suitable for all grades of iron needed.

Plates Slated for Rise, Too

• • • **Steel plates** were accidentally omitted from the list of products mentioned on page 96 of the April 27 issue, products which OPA has agreed to advance in price. On several previous occasions, in the market summary, "This Industrial Week," plates were mentioned with the other items.

NO "RE-CONVERSION" PROBLEM *with*

STANDARD Carboloy Tools



WHEN you use STANDARD Carboloy Tools you obtain top performance—maximum economy—on your war applications *now*, and at the same time remain in a position to quickly convert your stock of tools to peace-time use. With "standards" as basic stocks, you grind to special shapes to fill current needs *only*, and keep reserve stocks in the form of standard styles for quick, future conversion.

STANDARD Carboloy Tools, adaptable to 60%-80% of all single-point turning, boring and facing applications in the average plant—are available in 10 styles, all commonly used sizes, and a range of grades for maximum results on cutting steel, cast iron, non-ferrous metals and non-metallics. Write for catalog GT-175.

Adaptable

TO 60%-80% of all single-point-tool Turning, Boring, Facing Applications—for war or peace.

Training film strip available showing rapid grinding procedure

Write for NEW catalog GT-175

CARBOLOY COMPANY, INC.

11153 E. 8 MILE BLVD., DETROIT

Birmingham • Chicago • Cleveland • Los Angeles • Newark • Philadelphia
Pittsburgh • Seattle

CARBOLOY

TRADEMARK

For Cutting CAST IRON and Non-Ferrous Metals

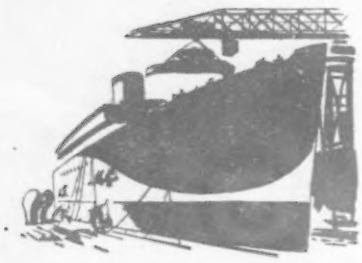
For Cutting STEEL

TUNGSTEN CARBIDES ★★★ TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES

WEST COAST . . .

OSGOOD MURDOCK

• Government bureaus tend to perpetuate economy of scarcity in Pacific area . . . Interesting figures on ship construction come to light . . . du Pont buys chemical plant at Tacoma.



SEATTLE—By how much must demand exceed supply to constitute scarcity? When should rationing and allocations begin? When should they end?

Answers to these questions begin to occupy principal attention both as respects staple and critical materials and also manpower, so far as West Coast industry and production are affected. Because of the rapid industrial development and distortions of the last two years, scarcity and emergency have been assumed by government agencies at practically all points and for practically all commodities including manpower. At the start, when torsions began and distortions were apparent, there were both logic and necessity in control. Over two years later there begin to be doubts. Power to control and direct seems eagerly assumed and reluctantly surrendered.

For instance, carbide for acetylene welding continues completely on allocations, even though the DPC plant at Tacoma, under Pacific Carbide Co. management, was closed early in March and several thousand tons of material are understood to be stored in warehouses at that point. There seems no scarcity in supply of carbide, although there is at present greater official pressure and reaction in connection with the use of carbide in shipyards and industrial plants, as respects supervision, regulation and the functioning of public agencies, than exists even in high pressure generators for its use. Within recent months, seven different explosions with seven fatalities have occurred in shipyards using high pressure generators and investigations are under way by sundry agencies including FBI, Federal Bureau of Mines, State Industrial Accident Commissions, Maritime Commission, DPC, Congressional committees and WPB. When all the story is told there will be facts of permanent technical interest and there may also be implications of considerable political and competitive significance.

Equally perplexing to members of the trade is the continued allocation of iron and steel scrap to preserve OPA ceiling prices when there appears neither scarcity nor desperate necessity even in the East and middle West and when there is such abundance on the West Coast that a free market would find a level below ceiling and would presently not utilize turnings, borings, bundles and No. 2 grades which help to depress the present market.

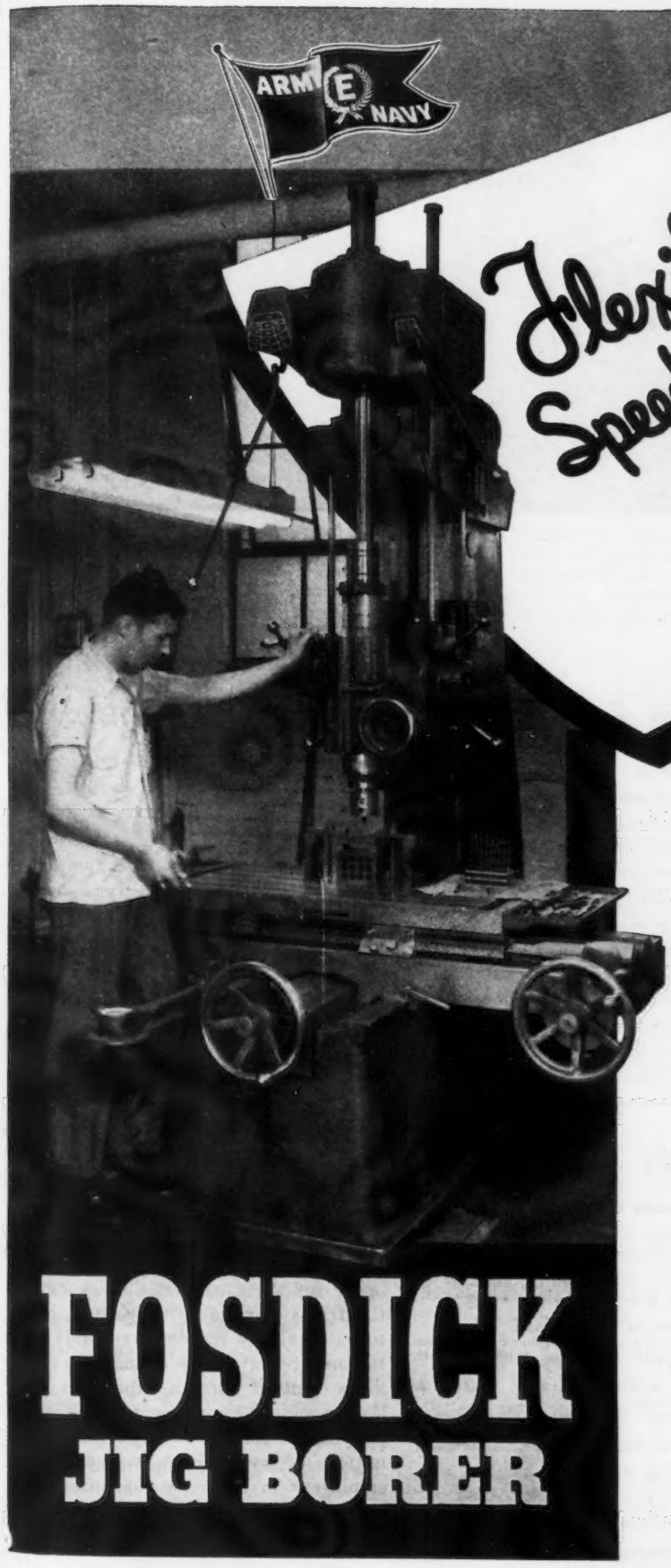
In the field of manpower, a complicated and elaborate procedure compels all clearances, all hiring and all terminations through the United States Employment Service under the constant and careful scrutiny of the War Manpower Commission. Employment managers and private procurement agencies grant that manpower is scarce, yet not as scarce as it has been and not as scarce as it would be without well organized bureaus and extensively manned public organizations whose only future consists in perpetuating a condition they created themselves.

FOLLOWING a chance appeal by WPB Vice-Chairman Joseph D. Keenan before the Pennsylvania State Federation of Labor for 4000 unskilled laborers at $1.00 per hr., and about 2000 skilled electricial workers, millwrights and welders at from $1.20 to $1.80 per hr. for a war project in central and eastern Washington, newspapers of the Pacific Northwest have finally admitted publicly a major war project that has been on every tongue but in no printed word for over a year. Known as the Hanford Engineering Works and under the direction of du Pont management, a military exclusion area of 500,000 acres in 15 townships has been set up along the middle reaches of the Columbia River in Benton, Grant and Franklin Counties, Washington, in a former dry, dusty, semi-desert marginal wheat area. Former tiny towns of 400 or 500 now teem with population. Richland is a city of 15,000, Pasco is bulging and Sunnyside, Kennewick, Benton City, Kiona, Prosser and Grandview are booming. At Richland a housing project includes 1300 permanent, individual, prefabricated homes in a $3,000,000 to $4,000,000 development. Schools are conducted in two shifts and a Kennewick trailer camp covers 68 acres with 1200 trailer units.

SIGNIFICANT and interesting figures on the cost of ship construction and contract basis come to light from time to time. In a criminal trial at Tacoma recently involving minor charges of fraud, a contract between the Navy and the Seattle-Tacoma Shipbuilding Corp. on escort carriers was introduced in evidence. On a vessel costing $7,290,000 the fixed fee to the shipbuilder is $364,500 with an additional bonus for completion ahead of schedule. It was furthermore brought out that the government owns approximately 85 per cent of the property occupied by the Seattle-Tacoma shipyard there.

At recent Congressional hearings, Edgar F. Kaiser, in charge of the three principal maritime yards in the Portland area, declared that his company has advanced $19,750,000 in capital for the operation of the Oregon Shipbuilding Corp. and the Vancouver and Swan Island yards. From Oregon Shipbuilding in a little over two years earnings of $16,000,000 have been developed before taxes estimated at a little over $3,000,000 net profit to be divided among ten owners. The fixed fee for the construction of each tanker at Swan Island is approximately $40,000, just as for a Liberty ship it is approximately $25,000.

California Shipbuilding Corp. at Wilmington, Calif., has reported that its invested capital includes $7,



Flexibility Speed and Ease of Operation

FOSDICK JIG BORER

● These are three characteristics of this modern heavy duty Jig Borer that have been helping a great many tool and die shops produce close tolerance work both in quantity and small lots at favorable costs.

The job shown is comparatively simple — three 3/8" holes and one 7/16" hole are drilled and bored in cold rolled stock for a punch retainer.

Whether the job calls for ten or a hundred pieces you can drill — bore — ream and tap the work easier . . . quicker . . . for less cost on a Fosdick Jig Borer . . . you will not need costly special jigs or fixtures.

Designed and built to meet close tolerances — so flexible that it handles a wide variety of distinctly different jobs—controls centrally located provide ease and speed of operation with minimum fatigue.

If you can do the job on a jig borer you can do it better — faster — for less cost on a Fosdick Jig Borer.

Write for complete details contained in Jig Borer Bulletin J.B.I. No obligation.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, · · · OHIO

300,000 and that its net for three years operation has been approximately $6,000,000.

At Richmond, the three Kaiser yards report that as of April 14 they had built 455 Liberty freighters, 30 British freighters, 13 C-4 troop transports, 15 LST landing craft and 12 frigate escort vessels. They have contracts to build 77 more Victory ships, 34 Liberty ships, 17 C-4 troop transports and 12 C-1 cargo vessels.

Seattle-Tacoma claims the third lowest absentee record for 52 major shipyards throughout the country last year. The lowest rate was four per cent and Sea-Tac's was five. Terminations have now passed new hires by better than 25 per cent.

ANOTHER important block was fitted into the mosaic of the growing West Coast chemical industry when E. I. du Pont de Nemours Co. announced the purchase of the Latimer-Goodwin Chemical Co. plant at Tacoma. It will be operated by Grasselli Chemicals Department of du Pont, manufacturing both Latimer and Grasselli brands. The plant was built in 1925 and produces lead arsenate and calcium arsenate, insecticides used for agricultural sprays. This follows by only a few months the equally noteworthy purchase by the nationally operating Monsanto Chemical Co. of I. F. Laucks, Inc., at Seattle, a well established and important local firm and operator in the Pacific Northwest.

LABOR CONFERENCE: *Delegates to the International Labor Conference at Philadelphia, Pa., April 20, are (left to right): Henry Harriman, United States, new chairman of the Employers Group; Sir John Forbes Watson, of Great Britain, vice-president of the conference; and Col. P. A. Chapa, of Mexico, secretary of the Employers Group.*

Restore Free Trade Unions, ILO Urges

Philadelphia

• • • In recommending a labor policy for liberated Axis territory, the 26th session of the International Labor Conference called for the restoration of free trade unions.

Five main points of discussion on the conference agenda were: Future of the I.L.O. and its relationship with other international bodies; recommendations to the United Nations; organization of employment in the transition from war to peace; social security, and social policy for dependent territories.

The 346 delegates, technical advisers and official observers heard speeches and resolutions from the various workers, employers and government representatives. Of particular interest was the address of Lombardo Toledoana, workers' delegate from Mexico, who called "Latin America a continent of semi-colonial countries, dependent upon the big international monopolies which exploit it as a zone for capital investment, a source of raw materials and a market for manufactured products.

"The people of Latin America insist upon the principles set forth in the Atlantic Charter," he said. "In order for these countries to share in the fruits of victory over fascism, international and national economic relations will have to be changed so that investment of foreign capital in the less developed countries will be subject to the control of tripartite committees of government, workers and employers in order to guarantee the allocation of capital to projects fundamental to interests of the nation.

"There must be conservation of natural resources, reinvestment of projects, just collective bargaining agreements, legitimate profits on invested capital, fair prices and stabilization of exchange rates," the Mexican union leader declared.

. . . Cited for Awards . . .

• • • The following companies have won the Army-Navy E award for outstanding war production:

Picker X-Ray Corp., New York. (second star)
Soule Steel Co., Los Angeles.
Wheeling Corrugating Co., Wheeling, W. Va. (second star)
Speed-O-Print Corp., Chicago.
Amertorp Corp., Naval Ordnance Plant, Forest Park, Ill.
Danly Machine Specialties, Inc., Cicero, Ill.
International Harvester Co., McCormick Works, torpedo section, Chicago.
Littelfuse, Inc., Chicago.
Reichel & Drews, Chicago.
Roberts & Oake, Chicago.
Western Electric, Inc., Teletype Corp., Chicago.
Allied Chemical & Dye Corp., General Chemical Co., Newell Works, Newell, Pa.
Atlas Powder Co., Atlas Works, Webb City, Mo.
Crowe Name Plate & Mfg. Co., Chicago.
Gaso Pump & Burner Mfg. Co., Tulsa, Okla.
General Chemical Defense Corp., West Virginia Ordnance Works, Point Pleasant, W. Va.
Gould & Eberhardt, Inc., Irvington, N. J.
The Hamlin Metal Products Co., Akron, Ohio.
Iowa Mfg. Co., Main Plant, Cedar Rapids, Iowa.
Lewyt Corp., Brooklyn, N. Y.
Lockheed Aircraft Corp., Factory "B," Burbank, Calif.
Milwaukee Forge & Machine Co., Milwaukee.
Molded Latex Products, Inc., Passaic, N. J.
Nashua Mfg. Co., Cordova Mills, Cordova, Ala.
Nashua Mfg. Co., Nashua Mills, Nashua, N. H.
Pacific Screw Products Corp., South Gate, Calif.
The Phister Mfg. Co., Cincinnati.
Solvay Process Co., Atmospheric Nitrogen Corp., Buckeye Ordnance Works, South Point, Ohio.
S. B. Whistler & Sons, Inc., S. B. Whistler & Sons Co., Buffalo.
Fidelity Machine Co., Philadelphia (second star).
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Victor Equipment Co., San Francisco (second star).
Link-Belt Co., Pacific Division, San Francisco.
Combustion Engineering Co., Inc., Savannah, Ga., plant.
Philco Corp., Storage Battery Division, Trenton, N. J. (third star)
Mack Trucks, Inc., Plainfield and New Brunswick, N. J., and Allentown, Pa., plants (second star).
Madison Iron Works, Inc., Madison, Wis.

MARITIME M

Combustion Engineering Co., Inc., Heine Boiler Division, St. Louis, and Hedges-Walsh-Weidner Division, Chattanooga, Tenn. (third star).

NEW...

COMPLETE stress-strain values on HIGH TENSILE STAINLESS

To provide designers of stainless equipment with useful compression and tension values of High Tensile Stainless Steel sheets, Armco has prepared a practical handbook of complete stress-strain data. It is the first time that such detailed values for stainless, both *above and below the yield point,* have been compiled.

Construction of aircraft and other light-weight structures demands adequate knowledge of the compressive strengths of structural materials. Ordinary formulas must be modified when used with materials such as stainless steel, which have non-linear stress-strain characteristics. The handbook provides the means of modifying the usual methods.

Data Insure Accuracy • Data in this handbook are invaluable for accurately proportioning *stronger, lighter* structural parts with *less* stainless steel. These are some of the important subjects it covers:

Some fundamental concepts of design theory to be considered when using stainless steels at the high stress levels where they are most effective.

Mechanical properties of the stainless steels and typical design data.

Stress-strain data from tensile and compressive tests on high strength stainless steel sheets, both above and below the yield point. These data are shown in curve form, and pertinent values are tabulated.

Significance of the tangent and secant moduli of elasticity in structural design.

If you are a designer, write us on your company letterhead and we'll send you a copy without charge. We know you will find it a valuable addition to your working files. Just address The American Rolling Mill Company, 1511 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION

STAINLESS ARMCO STEEL

THE AMERICAN ROLLING MILL COMPANY

PERSONALS

• • •

• **Gordon G. Johnson** has been appointed plant manager of Lycoming division of the Aviation Corp. in Williamsport, Pa. Mr. Johnson has been acting plant manager of Lycoming and previous to that was controller of the Aviation Corp.

• **W. B. Pierce** has been appointed manager of the newly formed market development division, Rustless Iron & Steel Corp., Baltimore. Mr. Pierce, who has been associated with the corporation since 1937 was formerly with the Aluminum Co. of America.

• **Burton T. Sweely,** formerly director of research, has been elected vice-president in charge of research of the Chicago Vitreous Enamel Product Co., Cicero, Ill. Mr. Sweely joined the staff of the company in 1932.

• **William P. Gwinn** has been made general manager of the Pratt & Whitney aircraft division, United Aircraft Corp., New York. He joined the division in January, 1927, and has been acting general manager several months.

• **Charles J. Koch** has been appointed engineer, and **Frank D. Phillips** assistant engineer, of the induction motor engineering division, General Electric Co., Schenectady, succeeding **Howard Maxwell,** manager, and **Milton H. Wells,** designing engineer, who have retired after 42 and 43 years, respectively, of service with the company.

• **Charles C. Tallman** has been appointed controller of Western Cartridge Co., East Alton, Ill. Mr. Tallman will be responsible for the accounting activities of Western and its Winchester Repeating Arms Co. division, where until recently he was a staff member of the treasurer's department.

• **George H. Rose** has been appointed assistant to vice-president of the American Steel & Wire Co., U. S. Steel subsidiary. **Eugene J. Reardon** has been named chief engineer of the company to succeed Mr. Rose.

• **James Tate** has been appointed director of marketing of The Dumore Co., Racine, Wis. He joined the organization as director of industrial and marketing research a year ago.

• **James W. Steel** has been appointed superintendent of Buffalo Dry Dock Co., branch of The American Shipbuilding Co. He succeeds **John Thompson,** who goes from Buffalo to Superior, Wis.

• **Harry D. Frueauff, Jr.,** president, Tool Engineering Service of Birmingham, Ala., has been appointed representative for the Cleveland Automatic Machine Co. in the southern states.

• **William Kerber** of Buffalo has resigned as deputy assistant director of the WPB Steel division in charge of raw materials and plant facilities in the plant-expansion program, to return to the Hanna Furnace Corp. of National Steel. He was Hanna's eastern district sales manager prior to the leave of absence granted him to go to Washington.

• **Jess W. Sweetser** has been appointed director of public relations for Curtiss-Wright Corp., Buffalo, with headquarters in New York. **Richard W. Darrow,** assistant director of public relations for the airplane division with headquarters in Buffalo, will be Mr. Sweetser's assistant.

• **Fred H. Haggerson,** vice-president and director, has been elected president of Union Carbide & Carbon Corp., New York, succeeding **Benjamin O'Shea** who has been president since 1941 and now becomes chairman of the board. Mr. Haggerson has been associated with Union Carbide & Carbon Corp. for 25 years.

FRED H. HAGGERSON, president, Union Carbide & Carbon Corp.

• **George M. Rigg** has been appointed assistant manager of the Weirton Coal Co., Weirton, W. Va. He has been chief engineer of the company and will continue to carry on the duties of this office as well as those of assistant manager.

• **V. J. Roddy** has been named vice-president of the American Screw Co., Providence, R. I.

• **F. H. Herndon** has been appointed manager of the coal stoker division, Link-Belt Co., Chicago. He has been assistant manager for the past 10 years. **K. C. Ellsworth,** heretofore eastern stoker division manager at New York, has been appointed sales manager of the stoker division, with headquarters at the Caldwell plant, Chicago.

• **Col. Philip J. Reilly,** managing director of the Associated Merchandising Corp., has been appointed to direct a distribution program for planned postwar production of household appliances for the Aviation Corp., Detroit.

• **Harold Brayman** has been made director of the public relations department, E. I. du Pont de Nemours & Co., Wilmington, Del. He succeeds the late **Theodore G. Joslin,** who died suddenly April 12.

• **L. L. Warriner,** president of the Master Electric Co., Dayton, has been elected a director of Cooper-Bessemer Corp., Mt. Vernon, Ohio.

• **John W. Dunn,** former director of quality for Curtiss-Wright airplane division, has been appointed to the same post by Bell Aircraft Corp., Buffalo. He will supervise inspection of materials and finished products in the Bell Niagara Frontier, Georgia and Burlington (Vt.) divisions.

• **Clarence F. Beddard** has been made general manager of sales, and **George L. Gaalaas,** manager of sales-electrical sheets of the Empire Steel Corp., Mansfield, Ohio. Both men have been affiliated with the sales department of the company for some years.

• **W. G. Gray** has become associated with Pittsburgh Steel Co., Pittsburgh, as railway development engineer for their railway products, with headquarters in Chicago. Mr. Gray has been master mechanic for the Virginian Railway for the past three years and was previously with the Association of American Railroads, the Union Pacific and the Lehigh Valley.

N. H. BRODELL, Cleveland district manager, Copperweld Steel Co.

J. RALPH PATTERSON and C. HOWARD PAUL, directors, Mackintosh-Hemphill Co.

• **N. H. Brodell** formerly metallurgical sales engineer has been appointed Cleveland district manager for the Copperweld Steel Co., Warren, Ohio.

• **James M. Hill** has been elected chairman of the board of Empire Steel Corp., Mansfield, Ohio, with **J. B. Montgomery, Jr.** succeeding him as president; **Oliver C. Henkel** was appointed vice-president, secretary-treasurer; **William H. Lake**, operating vice-president and **Roy I. Mitchell**, assistant secretary-treasurer and controller.

• **Charles F. McKenna, Jr.**, has been made manager of the special products sales division, General Aniline & Film Corp., New York, to succeed Roger Coleman.

• **John Sainsbury**, formerly of the Ahlberg Bearing Co., Chicago, has been named general manager of the Ross Operating Valve Co., Detroit.

• **John C. Vander Pyl**, vice-president and plant operating officer, has been elected executive vice-president of American Machine & Metals, Inc., East Moline, Ill. **Wayne Mendell**, general sales manager, has been made vice-president in charge of sales.

• **Thomas Gallagher**, assistant treasurer and manager of the Canadian company, has been elected a director of Handy & Harman of Canada, Ltd.

• **Alexander S. Basil** has been appointed assistant factory manager of the Lowell, Mass., plant, U. S. Rubber Co.

• **J. Ralph Patterson**, vice-president in charge of sales, and **C. Howard Paul**, treasurer and assistant to the president, have been elected to the board of directors of Mackintosh-Hemphill Co., Pittsburgh, Mr. Patterson has served successively as assistant manager and manager of Adamite sales, manager of roll and alloy sales, and general sales manager before being named vice-president. In 1924 Mr. Paul was appointed assistant treasurer, and in 1933 treasurer. He became assistaint to President J. S. Ervin in 1939.

• **Deane C. Crawford** has been made general sales manager of the full finished cap screw department, The Cleveland Cap Screw Co., Cleveland. **William C. Cooke** has been appointed sales manager of aeronautical and alloy steel division and **A. G. Thomas**, general purchasing agent of the company.

• **Lloyd E. Tracy** has been appointed general manager of sales, Oil Well Supply Co., U. S. Steel subsidiary, with headquarters at Dallas. He will be assisted by **F. D. Smith** and **A. C. Michaelis. George A. Hays**, vice-president with headquarters at Dallas, will devote his full time to major sales problems in all domestic areas. **R. R. McAfee**, Columbus, Ohio, succeeds Mr. Smith as manager of the eastern division, with **C. H. Maynard** as assistant manager. **K. B. Winstead** succeeds Mr. Tracy as manager of the midwest division and will make his headquarters at Dallas.

• **R. E. Busey**, formerly research engineer of The White Motor Co., Cleveland, has been named development engineer succeeding **Roger Weider** who was recently elevated to executive bus engineer. **L. W. Kinney**, formerly project engineer, has been made field research engineer.

OBITUARY...

• **Clement O. Miniger**, founder and chairman of the board of The Electric Auto-Lite Co., Toledo, and pioneer automobile industrialist, died recently. He was also chairman of the Bingham Stamping Co., and an active director of the City Auto Stamping Co. and the Air-Way Electric Appliance Co.

• **E. A. Hagerman**, general manager and a director, Worth Steel Co., Claymont, Del., died April 23. He was 58 years old.

• **Walter E. Becker**, widely known southern regional manager of the York Corp., York, Pa., died unexpectedly in Houston, Texas, April 10, at the age of 57. He had been with the Houston branch since 1922.

• **Frank J. Cunneen**, 53, Washington representative of Cochrane Corp., Philadelphia, Nordburg Mfg. Co., and LeRoi Engine Co., Milwaukee, died at his home, Washington, D. C., recently.

• **William H. Fitzell**, secretary and purchasing agent, the Berlin Construction Co., Inc., Berlin, Conn., died recently.

Fatigue Cracks . . . BY A. H. DIX

Skipped Beat

. . . Our copy of your April 6 issue came to us minus the last 16-page form. We realize there's a shortage of paper, but . . .

—H. C. Jaap, Jaap-Orr Co., Cincinnati 2

Like all of its kind, the gathering machine in our bindery occasionally rides by a scheduled stop. Although skips are rare, probably less than one in ten thousand, they could be avoided if the gathering machine people provided a device to discard "light" copies automatically.

But even that device would not be wholly foolproof, as a skip of one form could be counterbalanced by a double take of another. However, the odds against that happening would have to be figured in light years, so we recommend that the collating machine people put this on their postwar agenda.

Sparks in Alien Cerebrums

• • • In our youth we believed that practically everything worthwhile, outside of analine dyes, zithers and Scotch whiskey, was the product of American inventive genius. Even today we are shocked to find how often the trail of a development we had regarded as wholly native leads to an alien cerebrum.

Which is why we keep reminding you of your favorite family journal's thoughtfulness in publishing the lists of seized foreign patents for metal products and processes. All the lists published up to those in the past few issues have been reprinted in a 36-page booklet, "Seized Foreign Patents for Metal Products." Yours for 30c in stamps. For this week's list, see page 130. If you can look over these lists without finding something that will remove that lack luster look we will be chagrined.

Surprise

• • • The proprietor of a certain commercial service institution in one of our major industrial cities attended a dinner recently in the hope of meeting the head of a big firm he had been trying to enroll as a customer. At an adjoining table was a drunk who had acquired an active dislike for his immediate neighbor, and began to show his feelings by stirring his neighbor's soup with his finger.

Rather than create a scene, the drunk's victim endured this quietly, which so annoyed the drunk that when the turkey course came along, he seized his neighbor's drumstick and took a bite out of it. Still no reaction.

Finally the drunk, irritated beyond all measure, pushed back his chair and kicked his neighbor soundly in the shin. This produced an immediate result. Our hero, the proprietor of the commercial service, found himself a member of a flying squad that ejected the drunk from the banquet hall. Returning to his table, he asked one of his neighbors "Could you point out Mr. .....?" naming the head of the firm he hoped to sell. "He is the man," said his informant, "you just helped put out."

Abdominal Surgical Blunder

• • • The print shop innocently gummed up our last week's item about hari-kiri by trying to be helpful after we had O.K.'d the proof. It all started when we headed a paragraph "Excuse for Hari Kari." Several members of this page's loyal army of eighteen readers reminded us that the word is *hara-kiri*, whereupon we apologized, remarking wittily that we had thought the Jap substitute for aspirin and the hero of the old silent Westerns, Harry Carey, were homonymic.

But the print shop changed our wholly wrong *hari kari* to a weekly wrong *hari kiri*, thus putting our cowboy hero as out of place as if, clad in chaps, he had stumbled onto the set of "Jane Eyre."

Intrusive "R"

• • • Which reminds us that nature's abhorrence of a vacuum never equalled our print shop's dislike for a fancied hiatus in the name of the Parkesburg Iron Co. The print shop always tried, and sometimes succeeded, in introducing an imagined missing "r," causing the name to appear in print as Parkersburg.

Once a personal item about a gentleman with the Parkesburg firm appeared as "Mr. ....., of the Parkersburg Iron Co." The following week a correcting item read, "Last week's reference to Mr. ..... as being with the Parkersburg Iron Co. was incorrect. Mr. ..... is with the Parkersburg Iron Co."

Occupational Hazard

• • • Our Washington office sends us this help wanted ad clipped from a Washington paper:

> MAN with experience in caring for potted palms. Must be sober. Apply Mayflower Hotel.

In other words, only the palms must be potted.

Left-Handed Mike

> Did you notice the full page automobile advertisement running in the general magazines, which talks about work precise to the millionth of an inch and then illustrates it with such precise inch splitters as plain outside calipers, surfaces gages, and circular sheet and wire gages?
>
> The prize of the layout is a mike—the kind I have always wished for, being a southpaw. It is left-handed. More startling than that is the fact that the numbers on the barrel start at 9 and run down instead of up, so that the mike gives its maximum reading when it is fully closed.
>
> *—Deac*

A navy base dance hall proprietor's tolerance on payday night is narrow compared with the general magazines' editorial attitude toward technical accuracy. As editorial and advertising contents are merely equal parts of a whole, the editors' devil-may-care treatment of things Deac holds dear seeps by osmosis into the advertising pages.

A complaint to the management will get Deac nowhere. Our advice to him is to grit his dentures and bear it.

Wrong Solution

> Your Apr. 27 editorial, "You Press the Button . . .," reads:
>
> . . . before you knew it you had a darkroom, an enlarger, developing trays and what have you and were getting your fingers stained with hypo. Isn't it the developer that does the staining?
>
> *—L. E. H.*

Our pres. and ed. director, John H. Van Deventer, who wrote the editorial and who is an expert photographer, is out of town, so we put it up to Technical Editor Frank J. Oliver, inhabitant of the next cell, who also knows his way around a dark room. "I don't like to disagree with the boss," he began, "but . . ."

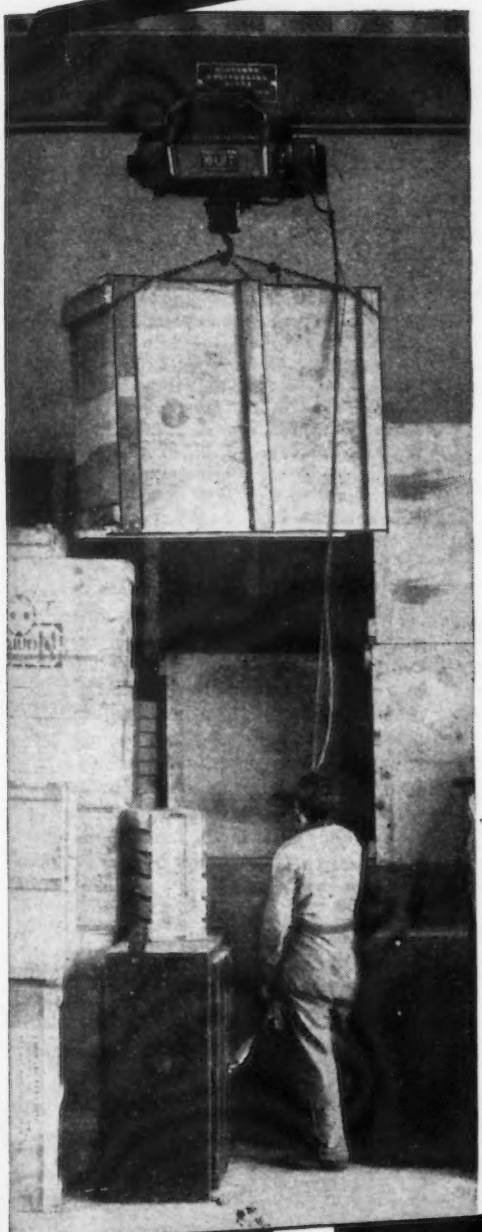
Puzzles

Last week's apples are divided thus: A 35, B 26, C 20.

This one, lifted from the Dictaphone Corporation's bright little publication, "It's Said and Done," must be done in 90 seconds to get you an A rating:

Two soldiers visit a canteen to buy cigarettes. The first buys one less than half the cigarettes in stock. The second buys one less than half the remainder. If 7 packages were left, how many were in stock at the beginning?

HOISTPOWER SAVES manpower



Northern

HI-LIFT ELECTRIC HOISTS

are available for prompt delivery

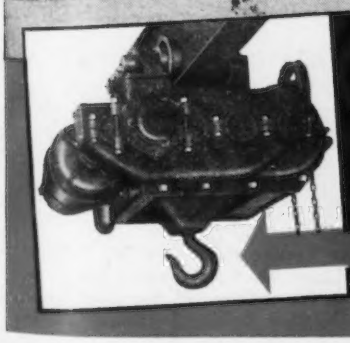
Until we are close to victory, the manpower situation is likely to continue difficult. Many plants will not have enough men, and man-hours will be costly.

Good hoist equipment makes better use of manpower—enables men to do more work with less effort—conserves costly man-hours. Look over your plant—you'll find many places where improved hoist equipment will save.

Northern Hi-Lift, Low Headroom Electric Hoists are available for prompt delivery. Increased capacity and improved manufacturing methods enable us to fill orders rapidly. These hoists are built to "take it", over a long period with an absolute minimum of attention. One-piece, welded steel frames—turned and ground shafts—large size roller bearings—machine-cut, heat treated gearing—splash lubrication—assure long life and low maintenance.

The Hi-Lift feature makes better use of headroom—increases the effective height of plants—makes easier the handling of bulky loads.

Write or phone for quotations



LOOK WHERE THE **Hook Goes**

NORTHERN ENGINEERING WORKS

General Office: 2607 Atwater St., Detroit 7, Mich.

NORTHERN CRANE & HOIST WORKS LIMITED, WINDSOR, CANADA

OFFICES IN PRINCIPAL CITIES

Dear Editor:

DRILL BREAKAGE REDUCER

Sir:

We read with interest your Apr. 13 article on electronic torque controllers as a means of preventing drill breakage. What is the address of Kirkman, who apparently developed the device and the H. E. Farmer Engineering Co., which has a similar device for a tapping unit?

FRANK KAPPLE

D K Mfg. Co.,
430 So. Green St.,
Chicago

● The Kirkman device is made by the Kirkman Torque Control Co., a division of the H. E. Farmer Engineering Co., 642 Beaubien St., Detroit 26, which engineered the rest of the machine design for deep hole drilling and is also developing similar equipment for tapping operations.—Ed.

STEEL WAGES

Sir:

Where can I obtain copy of "Steel Wages, A National Issue," a publication referred to on page 118 of your Apr. 20 issue?

HENRY S. EVANS,
President

Central Iron & Steel Co.,
Harrisburg, Pa.

● From the Steel Case Research Committee, 101 Park Ave., New York.—Ed.

ADVERTISING MEMO PAGE

Sir:

As a regular subscriber to your publication, and an avid reader of the advertising section, I have a suggestion to make that to my mind would be of great value to readers No one realizes better than yourselves that today's reader pays more attention to the advertising in a technical journal than to the articles and editorials themselves.

What I would like you to do is include a ruled blank page immediately after the "Advertisers' Index" headed "Advertising Reference Memorandum," and this page could be tabulated with columns headed "page number," "supplier" and "commodity."

Such a page would permit a reader to jot down all the items in which he is interested and probably intends to contact by mail and, I think you will agree, that such a practice would be a business promoter, as one frequently forgets either the name of the article or supplier by the time he has an opportunity to write.

My personal practice is to jot down the page number on the outside of the cover, but my suggestion would be a decided improvement over this.

J. RICHMOND, Manager
Pedlow Machine Company,
Chester, Pa.

● The suggestion is a novel one and will receive consideration. Readers using routing slips usually indicate on the slip itself the numbers of pages to be re-consulted. The routing slips, printed with the firm name and names of readers, may be obtained without charge by application to The Iron Age Reader Service Department.—Ed.

TRICLORETHYLENE SOLVENTS

Sir:

I am interested in receiving four tear sheets of your Mar. 9 article, "How to Use Triclorethylene Solvents."

We are installing a degreasing system and would like to use this information for our supervisory help.

W. C. PFEIFFER,
Factory Supervisor

Cherry-Burrell Corp.,
3002 West Burleigh St.,
Milwaukee

● The heavy demand for this has exhausted our supply.—Ed.

SHOP-UNIVERSITY EDUCATION

Sir:

Some time ago, perhaps 1941 or 1942, we read an article which we think appeared in THE IRON AGE describing a scheme for training university graduates in U. S. A., the basis of which was close collaboration between a number of engineering plants and a university which formed the educational center. Our recollection of the plan is that students in each year of training were divided into equal sections and each spent six months in workshops alternating with six months in university.

WILLIAM PATE,
Director and Works Manager

Albion Motors, Ltd.,
Scotstoun,
Glasgow, W. 4

● About twenty engineering colleges and technical schools employ the Cooperative Plan of Engineering Education in the United States. Students are divided into two equal sections and alternate between work periods and school periods. While one section is at work, the other is in college. The time of alternation varies from four weeks up to six months. The Iron Age has had no recent article on the subject. A bulletin may be obtained from Prof. F. L. Bishop, secretary, Society for the Promotion of Engineering Education, University of Pittsburgh, Pittsburgh, Pa. You might also write to the College of Engineering, University of Cincinnati, Cincinnati, Ohio, which was first to institute the system in the United States, sometime around 1908.—Ed.

STEEL PRIMER

Sir:

Could you suggest a book that would serve as a primer on iron and steel? I took a course in one of our technical schools but the textbook was too deep for most of us. It assumed we knew all about the subject. What I need is something on how iron and steel is made, the various types of furnaces, what constitutes the various analyses of steel and why and for what they are best used, why heat treating, eutectics and many other things.

I need this as I have switched from an automobile company advertising department to steel follow-up and control and as you can see I am in a mess and need help.

H.R.M.

Detroit

● One of the best of the elementary books on steel is "Steel for The User" by Rolfe, sold by the Chemical Publishing Co., 234 King Street, Brooklyn, N. Y. It deals primarily with the various steels and uses, testing procedures, etc., all couched in fairly understandable language. To supplement this you would need a book dealing with the actual production of steel. For this latter we suggest you write to the steel companies or to the American Iron and Steel Institute, Empire State Bldg., New York City. These sources have published simple non-technical books and pamphlets dealing with steel producing processes.—Ed.

MODERN HEAT TREATING

Sir:

Your article, "Modern Heat Treating Takes a Lot of Know-How," by A. S. Eves in the Jan. 13 issue, mentions several interesting methods. Who makes each?

ROBERT T. MILER,
Metallurgist P-3

U. S. Navy Yard,
Yard Testing Laboratory,
Pearl Harbor, T. H.

● Liquid Nitriding: A. F. Holden Co., New Haven, Conn., E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia, Pa.; Ihrigizing: Globe Steel Tubes Co., Milwaukee, Wisc.; Scottsonizing: C. U. Scott & Co., 1510 First Ave., Rock Island, Ill.; Hard-Cote: Hard-Cote Co., 325 W. Court St., Milwaukee, Wisc.; Carbide Case: A. S. Eves, 8146 Langley Ave., Chicago 19, Ill.; Nusite and Silver Finish Hardening: Perfection Tool & Metal Heat Treating Co., 1740 West Hubbard St., Chicago 22.—Ed.

NEW MACHINE TOOLS

Sir:

Your "News Front" of Mar. 30 mentions three machine tools recently completed in Detroit. "One that all but eliminates drill breakage by automatic reversal of the head when chips pile around the flutes; a machine which shapes gear teeth around circumference simultaneously; and a machine which broaches to spherical dimensions. Could you furnish us with the names of the firms building these machine tools?

W. H. ZOLLINGER,
Asst. Chief Engr.

Bethlehem Steel Co.,
Bethlehem, Pa.

● The machine that eliminates drill breakage by automatic reversal of the head when chips pile around the flutes was developed by the Kirkman Torque Control Co., Div. of H. E. Farmer Engineering Co., 642 Beaubien St., Detroit 26. For a description of it see pages 66-67, Iron Age, April 13. We hope soon to be able to give the names of the manufacturers and descriptions of the machine that shape all gear teeth simultaneously and the machine that broaches to spherical dimensions.—Ed.

RECIPROCATING DRILL

Sir:

Who makes the attachment that causes a metal drill to reciprocate?

C. G. WILKENHONER, Mgr.
Vibro-Tool Department

Burgess Battery Co.,
180 No. Wabash Ave.,
Chicago

● Bastian-Blessing Co., 4201 W. Peterson Ave., Chicago 30. For a description of the device see the article, "25 Per Cent Speed Increase by New Drilling Technique," page 48, June 17, 1943, issue.—Ed.

CUTS 23% MORE CHIPS *per hour*

with Monarch Automatic Feed Changes!

Machining time on this shaft was cut 23%, by using Automatic Feed Changes on a "Monarch Automatic Sizing Lathe". This substantial time saving is especially important today . . . and also indicates how costs can be cut with modern equipment. This 23% saving will be multiplied by the number of machines attended by each operator.

This specific job has five diameters, with feed rates automatically ranging from ½" to 2" per minute, determined by the depth of cut. Without Automatic Feed Changes, all diameters would be machined at the feeding rate for the starting diameter.

Monarch Automatic Sizing Lathes, with Automatic Feed Changes, have many applications for step shaft turning and similar work. Our engineers are at your service to see if their advantages can be applied to your work to save time and reduce costs.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

MONARCH LATHES
Save Time

Automatic control mechanism is centered in the cabinet which houses the necessary rheostats to control the speed of the 4 to 1 d-c motor driving the entire feed unit. Any desired feed, from lowest to highest, is automatically provided for any or all diameters. Or, the Automatic Feed Change unit may be instantly disconnected, to allow constant feeding rate on all diameters.

This Industrial Week . . .

- **Recent Large Orders for Shell Steel Said to Be Only a Start**
- **Huge Program Expected to Heighten Tension in Steel Industry**
- **Flat-Rolled Situation Still Remains Serious Problem at WPB**

OVER the United States and Canada, the clatter of shell making shops is growing more intense as the time nears for heavy artillery action by the Allies. The steel industry has been given to understand that the large orders recently received for shell steel, which threaten to make balanced production difficult, are only a start. In third quarter the armed forces will require 195,000 tons more than in second quarter, it is said.

In order to produce all the steel demanded for the immense new shell program, some of the previously high rated military projects may have to be switched to other materials, while production of structurals, rails and other products may be restricted. Hopes held in some quarters for additional civilian steel over the next six to eight months definitely have been dimmed by the continued high demand from the military authorities. The rail directive for third quarter probably will be slashed by 50,000 tons.

One large shell steel producer currently is producing its product at 95 per cent of normal capacity and at a rate representing an increase of 75 per cent over its average output for the last 20 months. It anticipates that this will be increased 35 to 40 per cent more for the third quarter. Among recent new shell contracts reported awarded is one for $25,000,000 to Kaiser Co., Inc., Fontana, Calif. Using steel ingots from the Fontana steel works, forging and rough machining of artillery shells will take place in an extension to be constructed by the Army Engineers. The structure will be equipped with government owned machine tools. Finished machining will take place at the Denver Ordnance Plant, which will be leased to Kaiser Co. to utilize surplus labor available in that area.

SHELL steel, which added over 100,000 tons in new orders to steel company books in March, will require more ingots because of the heavy cropping required and will heighten the tension in ingot processing departments. Therefore, all through the industry the effect will be felt.

The shell program will continue into 1945, according to present plans, and at the same time there will be continued emphasis upon guns, heavy vehicles and their parts, a new type of landing craft, more landing mats, a new type of explosive shell, aircraft design changes and the big shell container program. Also, lend-lease requirements are heavy.

The flat rolled situation still remains a serious problems at WPB where unexpected third quarter demand for plates by the Maritime Commission and for tin plate by the War Food Administration have complicated previous estimates of when flat rolled products would be easier.

The fact that WFA has upped tin plate requirements about 100,000 tons for the third quarter, together with the new shell container program, has caused a conflict between sheet and tin plate demands which Steel Division officials say makes the "picture tough to fit together."

Plate output for April is expected to prove to be just short of 1,200,000 tons, nearly as high as the record of March which was approximately 1,220,000 tons. However, the Maritime Commission is now asking for 100,000 tons more plates in the third quarter than it had previously indicated, making the total plate demand for Maritime about 1,200,000 for the quarter.

THE steel industry last week hammered at union contentions in the steel wage case, particularly against the union cost of living claims. Leaders like Irving S. Olds and E. G. Grace emphasized the importance of the case, not only for the steel industry but for the entire public. Mr. Olds said at the U. S. Steel Corp. annual meeting this week, "The granting of wage increases of this character must inevitably result in higher wages in all industries and in higher prices for almost everything else which all of us buy. The corporation is financially unable to absorb such higher employment costs without an increase in its present prices for steel products. . . . Average weekly earnings of steel workers in the corporation are today more than 50 per cent in excess of their average weekly earnings in January, 1941." Mr. Grace, head of the Bethlehem Steel Corp., stated last week that average weekly earnings of his steel workers had risen from $34.11 in January, 1941, to $52.36 in January, 1944.

WLB has announced two more six-man panels in the steel wage case. One will hear the cases of 41 iron ore companies. The other panel will hear cases covering 350 fabricators and miscellaneous companies.

Machine tool executives and engineers sat down with officials of General Motors Corp. last week and were told what the automotive firms

News Highlights in This Issue

Steel Market Briefs

• GENERAL—The steel situation is tighter than any time since the war started. Third quarter demand expected to outstrip supplies. Magnitude of shell program will affect production of rails and structurals in third quarter. April orders way ahead of shipments. Total backlogs still heavy.

• PRODUCTION — Steel output at maximum, consistent with manpower. Some sources look for decline in summer months due to heat effects. This may not be as severe as now expected. Manpower shortage may accentuate summer seasonal influences. Ingot supply tighter than ever. Semi-finished even more tight. Some semi-finished steel schedules filled up beyond October.

• SHELL STEEL—By October, shell steel output expected to be more than 230,000 tons a month. Substantial gains expected from here on out.

• FLAT ROLLED—The mid-year cutback on plates fully expected to be made up by sheet specifications. Maritime cutbacks in June on plates for some makers is being offset by certain CMP plate orders which constitute carryovers. Other makers not so affected are rapidly filling space with sheets.

• TIN PLATE—Third quarter output, which is being pointed towards 825,000 tons, (second quarter setup) will depend on availability of steel and rolling space. Competition between sheets and tin plate will probably find the latter the winner.

• SHIPBUILDING—Increased emphasis is looked for on tankers in third quarter. Landing craft program expected to continue at good clip as long as war lasts.

• MISCELLANEOUS—Some steel producers are reluctant to accept advance buying until the military situation clarifies. Main exception to this is farm and implement makers' orders, which are said to be substantial for first quarter of 1945. Biggest jump in delivery dates is in hot rolled carbon bars, reflecting shell program. One large producer has no space on large sizes in 1944.

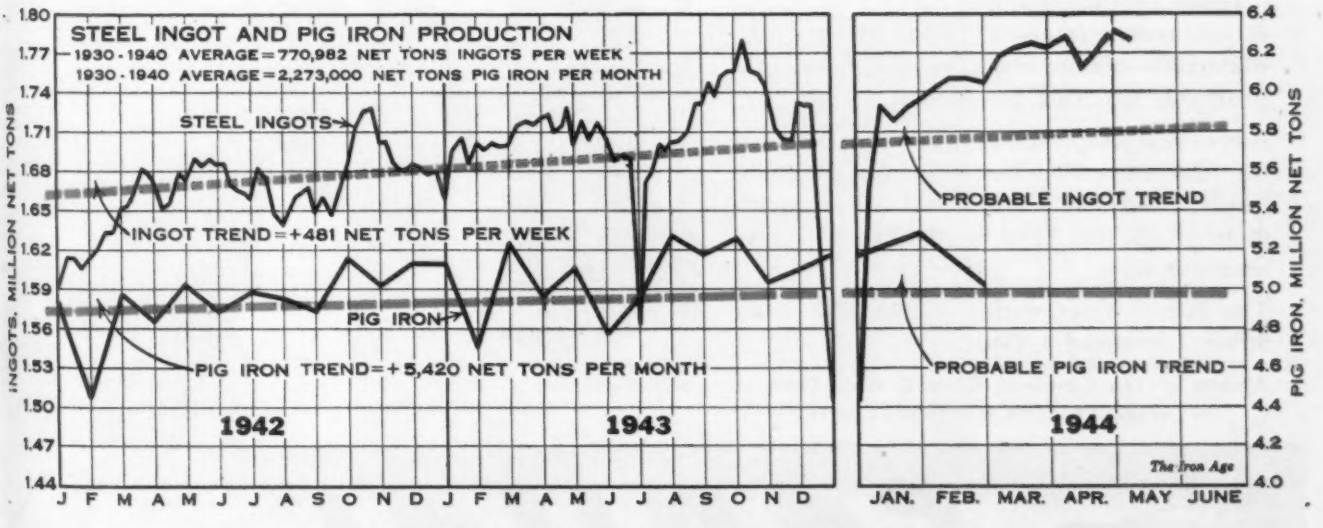
seek in performance. Among the improvements desired are greater standardization; faster feeds and speeds; full electric controls; more rugged machines; better chip disposal; electronic controls; and wider use of hardened and ground ways.

All restrictions on the use of corrosion resistant steels in aircraft, except directive 14A on the still-critical columbium-bearing type, are being removed. At the same time, dairy equipment makers have been given permission to make weigh cans and receiving tanks of stainless steel.

Donald M. Nelson, head of WPB, stated last week that 5300 farm tractors now are being produced weekly, double 1943 weekly output, and that the making of repair parts is up 167 per cent. The Farm Machinery Advisory Committee assured WPB last week that the production program for 1944 will be realized with the exception of certain items. Implement makers are now reported to be placing substantial orders for first quarter of 1945.

COL. C. R. BAXTER of the WPB Redistribution Division stated last week that at the end of March his division listed 300,000 tons of available steel, while in the previous two week period 50,000 tons had been sold and 70,000 tons were taken in. For the same period 20,000,000 lb. of copper were available, while in the previous two week period 1,128,000 lb. were sold, and 2,083,000 were taken in. In aluminum, 7,000,000 lb. were listed and 2,250,000 lb. sold in the two week period.

WPB has reinstated the warehouse load directive on carbon bars, to become effective in July and beyond.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
April 27	96.5	103.0	97.0	91.5	105.0	104.5	96.5	99.0	100.5	113.0	96.0	99.0	102.5	99.0
May 4	96.5	102.0	97.0	91.5	98.0	104.5	98.0	99.0	102.0	93.5	104.0	99.0	96.0	98.5

Steel Companies Open Attack on Union's Cost-of-Living Date And Assert Higher Wages Will Force Higher Prices

By DONALD BROWNE
Washington Staff

o o o

• • • **The objective** of company testimony before the WLB Steel Panel last week was to blitz to a standstill union wage claims by showing the inaccuracy of union contentions on the cost of living, that wages have not deteriorated, and that steel companies cannot pay higher wages without getting price increases.

If wages and steel prices go up, the industry says the country can look for all-out inflation which will be difficult, if not impossible to check once started. The disastrous effects of runaway inflation were described in some detail.

The panel adjourned on Friday to permit the general presentation to continue about the middle of May. Estimates are that the general presentation will be finished in about two months, after which individual proposals of different companies, and the Union's case against the steel casting industry will be taken up by the panel.

C. A. McLain, attorney for the Steel Research Committee and counsel for the Bethlehem Steel Corp., spoke on Tuesday afternoon and Wednesday on the 17c. and other wage demands as affected by the stabilization program.

Mr. McLain contended that:

1. Neither the National Economic Stabilization program nor the Little Steel formula, which is an integral part of the program, constitutes or has ever constituted any commitment to labor that wages would be adjusted to keep pace with the increase in the cost of living.

2. On the contrary, the Little Steel formula as originally announced by the WLB and as subsequently written into the National stabilization program by Congress and the President sought to stabilize wage rates at approximately 15 per cent above January, 1941, levels and thereby stop the race between wages and prices.

3. The wage demands of the union cannot be granted within the limitations of the stabilization program.

4. Any modification of the program which would permit the granting of the wage demands would be contrary to the provisions of the Stabilization Act of Oct. 2, 1942.

5. The claim of the union is without merit, that the government has failed to carry fully into effect other parts of the stabilization program, and therefore the wage stabilization program must be revised to permit the granting of the union's 14 point security demands.

6. There is no basis for a claim by the union that a change in the stabilization policy is necessary "to aid in the effective prosecution of the war or to correct gross inequities."

Mr. McLain branded as ridiculous the union charges that Congress has encouraged inflation, sabotaged effective price control and intimidated the executive branch of the government. He said the attack is surprising only in the sheer recklessness of the charges which the union made and the arrogance of the language in which they were made.

"The significance of those charges, however, lies in the fact that they are typical of the political tone of the union's entire presentation in this case," Mr. McLain asserted. "The union apparently believes that by smearing the Congress, the administrative agencies, and the companies it can justify its demand for wage increases and gloss over the weakness of its case. It is obvious that this panel cannot in this case try the Congress, the administrative agencies and the company on charges of sabotage, intimidation and profiteering."

To refute the union's claim that the cost of living has gone up at least 43.5 per cent from January, 1941, to December, 1943, Mr. McLain called attention to the latest report by Economic Stabilizer Vinson, OPA Administrator Bowles, WFA Administrator Jones and WLB Chairman Davis. That report made on April 7th that efforts to "hold the line" had resulted in stopping the monthly rise of ¾ per cent in the cost of living so that the "line" has been held for a solid year without any change of consequence.

Commenting sarcastically, Mr. McLain pointed out that maybe these officials are among those officials and economists "whom the union mentions on page 36 of its brief as trying to panic the country with wild predictions concerning the inflationary gap."

He capitalized on the union contention that steel wages have been stabilized under the Little Steel formula by proving that steel wage rates have been stabilized not wages. He showed through use of Bureau of Labor Statistics figures that average hourly earnings have gone up 32.5 per cent and that average weekly earnings have increased since January, 1941, 56.2 per cent, while the cost of living index increased from January, 1941 to January, 1944, by only 23.1 per cent.

He explained:

"It is true that a part of the increase in the earnings has resulted from an increase in the number of hours by them, but it all goes into the pay envelope, and it is all available to meet increases in the cost of living."

Dr. Donald R. G. Cowan, Republic Steel Corp. economist, told the steel panel on Thursday that union claims that wages should

• • •

NEWS OF INDUSTRY

PROTECTIVE VIGIL *of the Royal Navy never ceases. Here is one of the* 35,000 *ton battleships of the King George V class and an escorting destroyer on patrol in Northern waters at sunset.*

be increased to compensate wage earners for increases in the cost of living is based upon a fundamental fallacy.

Dr. Cowan asserted that there has grown up a general belief that there is some virtue in a policy of wage stabilization whereby wages are currently adjusted to changes in living costs, while actually the pursuit of that policy would accelerate inflationary trends and defeat its own purpose.

To contend that wages should be increased because prices have been increased is to lend support to an upward inflationary spiral. Starting the race between wages and prices which the stabilization policy sought to prevent the union's wage demands must inevitably lead to the upward spiraling of the cost of living which it is the purpose of the President's seven-point program to prevent.

Dr. Jules Backman, United States Steel Corp. economist on Friday showed that the Meany-Thomas report upon which the union largely bases its claim that the cost of living has risen 43.4 per cent since January 1, 1941, was indirectly rejected by the endorsement by Special Committee of the American Statistical Association of the Bureau of Labor Statistics estimate of 23.3 per cent. Dr. Backman also showed that the BLS and the National Industrial Conference Board had severely criticized the Meany-Thomas report. He declared that the Bureau of Agricultural Economics estimate of a rise of 42.6 per cent, since it was for rural communities, was based on different data and conditions than the BLS report.

The economist also introduced BLS figures to show that while the cost of living rose 5.3 per cent between September, 1942, and January, 1944, hourly wage rates in the industry for the same period rose a corresponding per cent.

Shipyard Renegotiation Formula Announced by Maritime Commission

Washington

• • • **An agreement with** the Oregon Shipbuilding Corp. has been set up as a basic formula for renegotiating the ship construction contracts awarded to the group of Liberty shipbuilders who received their first contracts in 1941, the U. S. Maritime Commission announced. The case of the Oregon Shipbuilding Corp. covered the first five contracts awarded to that corporation, aggregating 181 Liberty cargo ships completed prior to May 4, 1943.

The formula as established in the Oregon case sets up four factors, based upon the actual performance record, which modify the maximum amount payable upon a ship. It continues the incentive features embodied in the shipbuilding contracts; and is consistent with the commission's action of negotiating reduced fees in the award of subsequent contracts to these yards yet accomplishes the purpose of the Renegotiation Act by eliminating excessive profits.

For each one of the four respective periods, the yards are rated according to their actual performance record. These ratings are established on the basis of: (1) The lowest number of man-hours actually used in the construction of each vessel, (2) the lowest dollar cost of each vessel, (3) the largest number of ships delivered during the period from each shipway in the yard, and (4) the lowest dollar investment of government facility in the yard charged to each vessel. By taking these four ratings and combining them for each yard and applying the result against the perfect rating of 100 per cent, the actual rating of each yard is obtained. This percentage is then applied to the difference between the maximum and the minimum fee for each given period and this establishes the actual fee to be paid to the yard for each vessel delivered in that period.

The incentive system established under the Liberty ship contracts created keen rivalry among shipbuilders to reduce man-hours and cost. This competition reduced the man-hours from the first estimates of 635,900 per ship to an average of 520,000 and in one case to below 350,000. In terms of money saved this has reduced the cost of Liberty ships to approximately $157 per deadweight ton, as compared to about $210 for the Hog Island vessels of the last war, despite the very substantial increase in wage rates that now prevail over that earlier period.

Two More Panels to Hear Sections of Steel Wage Case

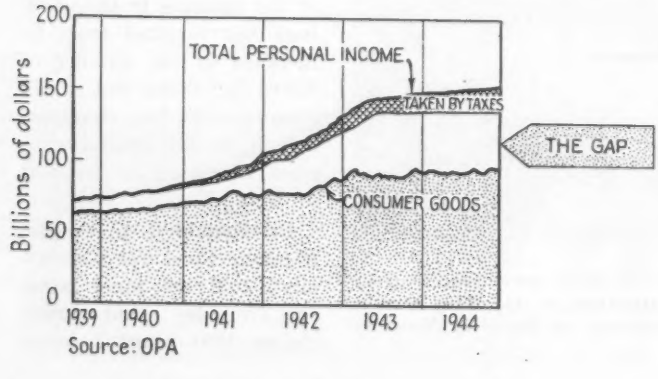
Washington

• • • **The WLB** has announced that two more six-man panels will be named to sit in the steel wage case. One panel will hear the cases of 41 lake iron ore companies. The other panel will sit on cases covering 350 fabricators and miscellaneous companies, many of whom neither make nor buy steel. They were brought into the case along with the "basic steel" makers simply because they have or had contracts with the CIO-USWA.

It is the plan of WLB to have the iron ore panel prepare a report to the board at the same time the "basic steel" panel makes its report. The miscellaneous panel's recommendations will not be made until the "basic steel" and iron ore hearings are finished.

Continental Can Will Build Modern Plant in Mexico

• • • **Continental Can Co., Inc.** will shortly extend its interests to include Mexico, according to Carle C. Conway, chairman of the board and president of the company. This will be accomplished through a Mexican corporation, now in process of formation, which will build a modern can manufacturing plant in Mexico, D. F.



o o o

THIS CHART *was introduced by Dr. Jules Backman showing the inflationary effect of increased wages and reduced amount of consumer goods and services. Dr. Backman answered the union's charge that corporate profits have not caused inflation because dividends were the same last year as in* 1940 — $4,000,000,000.

o o o

Carnegie Illinois to Be Tried on Two Indictments as Plate Case Opens

Pittsburgh

• • • **With indications** that it might continue perhaps for a month, the United States government suit against Carnegie-Illinois Steel Corp., U. S. Steel subsidiary, charging falsification of records of tests made on steel plates, began here May 1.

Two days were consumed in picking the jury, and after the presentation of the government's opening address, examination of the witnesses was to have started late on Tuesday or Wednesday.

The steel company is being tried on two criminal indictments in federal court here. One involves 47 counts of alleged falsification of records of test made on steel plates for governmental agencies. The second indictment charges Carnegie-Illinois with concealing records of the tests.

Officials and employees of the company, who had been summoned as witnesses, will only be called from their work "as needed" in order to eliminate interference of war production, according to the government counsel.

The government's address by counsel constituted a detailed explanation of the two indictments and the counts under each of them. A description of what constituted heat numbers, ladle analyses, physical tests, etc., was given by the government counsel. Charges were made that the steel company had falsified certain records pretaining to heat numbers and physical test results.

The case grew out of an investigation by the Truman Committee some time ago, and the suit has been postponed until the present time.

•

At the annual meeting of U. S. Steel Corp. in Hoboken, N. J., on Monday of this week, Irving S. Olds, chairman, discussed the Irvin works as follows:

"My remarks at the annual meeting of stockholders a year ago included an account of irregularities in the testing of plates at the Irvin Works, about which testimony had then been recently given before the Truman Committee in Washington. The stockholders will be interested to know that this great strip mill, which was not designed for the production of plates, continued during 1943 to turn out vast quantities of the plates so vitally needed for the various Government shipbuilding programs. In fact, Irvin Works contributed materially to the Corporation's total plate production last year, which exceeded by 11 per cent the 1942 record tonnage of 4,000,000 tons of plates. During 1943, the Corporation produced more than one-third of all the ship plates rolled in the United States in that year. Despite the truly remarkable record of performance at Irvin Works, a trial commences in Pittsburgh today in which the Government seeks to convict Carnegie-Illinois on charges of alleged criminal conduct in connection with the testing of a very small part of the 1942-1943 plate production at that mill."

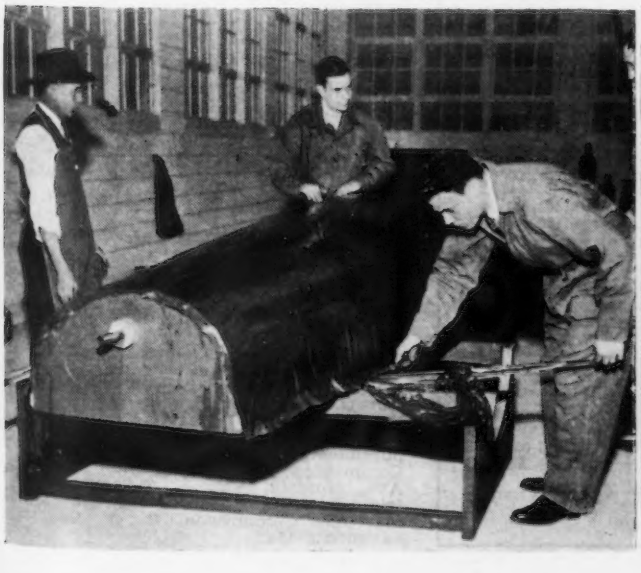
WPB Personnel Changes

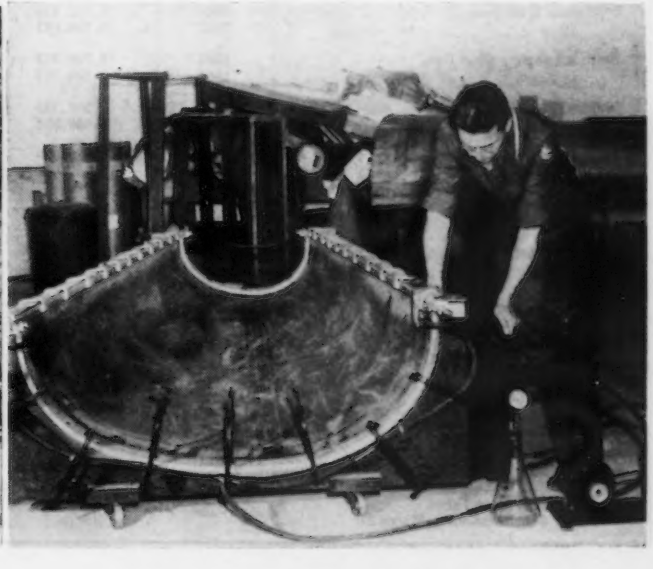
• • • **William B. Todd** was appointed assistant deputy director of the WPB Steel Division, and Alex Miller assumed the duties of chief of the Raw Materials Branch, according to Norman W. Foy, director of the WPB Steel Division.

Mr. Todd has recently served as a representative of the Steel Division on the staff of the American Mission in London, and Mr. Miller, who is also chief of the division's Scrap Section, assumed the duties of chief of Raw Materials Branch.

WPB Vice Chairman, William L. Batt, appointed Frederick M. Eaton as deputy member of the Combined Production and Resources Board. H. C. L. Miller was appointed United States executive officer of the board, and Allen Peyser was made executive director of the board.

PLASTIC FUSELAGE GLASS-REINFORCED: *An Army basic training plane with glass-reinforced plastic fuselage has been given successful flight tests. At left, fabricating the glass-reinforced plastic fuselage. Plies of glass cloth impregnated with a resin are laid over a male mold. At right, the assembly of impregnated plies of glass cloth and balsa wood core is placed in the female mold. A rubber blanket is laid over the assembly and sealed on the edges. A vacuum is drawn with a small vacuum pump. Atmospheric pressure replaces high-pressure autoclaves. The mold is rolled into an oven where the assembly is subjected to a temperature of 220 deg., F., for three hours.*





Effort to Expedite Movement of Surplus Property Disclosed by Clayton

Washington

• • • **Surplus** War Property Administrator W. L. Clayton last Friday announced a major hurry-up price policy for the quick disposal of surplus property left over from the termination of war contracts. The material has piled up rapidly and already amounts to several hundred millions of dollars in value and is increasing daily, according to Mr. Clayton, who wants to get it back into production. It consists of raw materials, semi-finished goods and scrap coming to the Government from manufacturers whose war contracts are being completed. It does not include property declared as surplus by the procuring or owning agencies of the Government. This property will be disposed of by agencies under regulations yet to be announced.

Virtually all the materials to be disposed of under the policy announced by Mr. Clayton, he said, are usable only for manufacturing purpose. The policy covers materials, in some cases the property of the contractor, in other cases the property of the Government, but in all cases, still on the premises of the contractor and not yet moved into Government salvage.

While the policy is designed to discourage speculative buying, and seeks to get the highest obtainable price, it has aroused interest because it does not follow the Baruch recommendation for rationing surplus material into the markets in an orderly manner.

Nevertheless the policy apparently has War and Navy approval even though the military branches hold a tight rein over civilian production. The policy evidently was inspired by the desire to work up surplus material into civilian production where that is possible and consequently is responsive to a popular demand in Congress. Mr. Clayton indicated as much when he said that aggressive action is necessary to move the material back into war production or for civilian use. He pointed out that it is now accumulating faster than contracting officers can dispose of it.

Mr. Clayton said that the Government's paramount interest is the continuous use of this material in war production, or for essential civilian purposes, avoiding over-burdening storage facilities, arresting inflationary trends, and reducing the volume of surpluses which will be hanging over the market after the war.

The policies established rest on the following basic principles:

1. Quick clearance of plants for resumption of war production or essential civilian production is imperative.

2. Sales to the contractor or other buyers who will themselves consume the property in production are desirable.

3. Sales to speculators for holding or quick profits must be discouraged.

4. No goods must be sold without an adequate test of the market.

Some of the essential elements in the pricing policy announced are:

1. Small terminations and small quantities: Materials of any type may be sold at the best price obtainable if left over from a contract or subcontract where the claim against the government is below $10,000. Similarly, small quantities of materials, regardless of the size of the termination claim, may also be disposed of at the best price obtainable, where the cost of all substantially similar items at any one location does not exceed $1,000.

2. Raw materials: Crude or simple raw materials not covered by paragraph 1 are to be sold at the going market price if in commercial lots, where there is a clearly established and readily ascertainable market price. If a sale at the going market price cannot be made, the property will then be turned over to a disposal agency for sale.

3. Other materials: Usable property not covered by Paragraph 1, other than raw materials, may be sold to any buyer whether or not he is a consumer at the best price obtainable in excess of 75 per cent of either cost or the price which that buyer would have to pay if he bought an equivalent quantity from a normal source of supply, whichever is lower. If a sale cannot be made on this basis within a reasonable time, the property may be sold at the best price obtainable.

4. Scrap: The responsibility for determining what is scrap is on the procuring agency. Where the amount of property to be scrapped exceeds $50,000, the final determination to scrap will be subject to a reviewing authority.

Scrap not covered by Paragraph 1 may be sold at the going price for the type of grade of material involved. If such going price for scrap cannot be realized, the contracting officer will arrange for bids.

5. WPB and OPA: All sales are subject to applicable regulations of the WPB and OPA.

Steel Earnings, First Quarter, 1944

COMPANY	First Quarter	Net Income, Dollars	Estimated Federal Income Taxes, Dollars
U. S. Steel Corp.	1944	$17,027,616	$15,200,000
	1943	15,406,597	28,100,000
Bethlehem Steel Corp.	1944	6,432,538	24,310,000
	1943	6,228,693	28,880,000
Jones & Laughlin Steel Corp.	1944	1,708,352	2,417,000
	1943	2,399,369	6,398,050
National Steel Corp.	1944	2,550,143	4,850,000
	1943	2,680,850	6,325,000
Youngstown Sheet & Tube Co.	1944	1,636,369	4,222,000
	1943	2,147,027	6,761,000
Inland Steel Co.	1944	2,512,396	4,503,000
	1943	2,796,321	5,100,000
Wheeling Steel Corp.	1944	992,945	1 291 000
	1943	961,391	1 659 000
Pittsburgh Steel Co.	1944	114,939	95 600*
	1943	.....	.....
Sharon Steel Co.	1944	166,511	595,000
	1943	445,564	1,593,000
Lukens Steel Co.	1944†	277,998	.....
	1943†	591,968	.....
Rustless Iron & Steel Corp.	1944	544,068	1,483,000
	1943	822,681	2,199,000

* Includes State Taxes.
† For 6 months ending March 31.

Maritime Starts Drive To Sell Surplus Materials

• • • **An intensive** campaign inviting the public to purchase by competitive bidding, surplus materials in shipyards under the jurisdiction of the United States Maritime Commission along the eastern seaboard is under way, says B. E. Prescott, district purchasing officer, Room 1072 Ledger Building, 6th and Chestnut Streets, Philadelphia 6.

The program is not limited to manufacturing firms, suppliers or jobbers, but the general public is particularly invited to submit bids.

Generally the materials will be sold F.O.B. shipyards and further information may also be obtained from the following district purchasing officers:

A. B. Whitworth, district purchasing officer, United States Maritime Commission, 45 Broadway, New York 6; J. B. Abbott, district purchasing officer, United States Maritime Commission, 22 Light Street, Baltimore; L. A. Holman, district purchasing officer, United States Maritime Commission, 12th Street and Monticello Ave., Norfolk, Va.; L. T. Johnson, district purchasing officer, United States Maritime Commission, P. O. Box 979, Savannah, Ga.

Government Owned Equipment Exempt From State Taxes, Supreme Court Rules

Washington

• • • **In a decision** that will affect producers of war materials throughout the nation, the United States Supreme Court ruled on May 1 in a 7 to 2 decision that states cannot constitutionally assess real property taxes against federally owned machinery and equipment in war plants.

This ruling, announced by Justice Robert H. Jackson, reversed the ruling of the State Supreme Court of Pennsylvania that sustained the state's power to tax the Mesta Machine Co., West Homestead, Pa., to the amount of $5137 on government owned machinery valued at $618,000.

Justice Jackson stated that "a state may tax personal property and might well tax it to one in whose possession it was found, but it could hardly tax one of its citizens because of monies of the United States, which were in his possession as Collector of Internal Revenue, postmaster, or other federal officer." It was held that government owned property, to the full extent of the government's interest therein, is immune from taxation either as against the government itself or as against one who holds it as a bailee.

Under an agreement with the War Department, Mesta had leased equipment owned by the government to make large field guns. The controversy occurred when Allegheny County, Pa., demanded the $5137 tax, which Mesta paid under protest. The Court of Common Pleas held the tax invalid because the machinery was government owned, but the State Supreme Court reversed the decision, holding that while federally owned property was non-taxable, in this instance the assessment was against Mesta, which was operating for private profit.

Two Aluminum Lines Shut Down

Washington

• • • **WPB on Tuesday** announced it had taken another step to bring aluminum metal production more closely in line with consumption.. The Aluminum and Magnesium Division requested the DPC to order the Aluminum Co. of America to shut down two more lines at the government owned reduction plant in Queens, New York. Each of these lines had an annual capacity of about 36,000,000 lb. of virgin aluminum. The fundamental reason for this curtailment, as with others in aluminum metal production, is that armed services requirements are not as great as originally estimated, WPB said.

Production of aluminum metal had been running in excess of requirements, WPB officials said. Recently the agency was notified that certain foreign demands that were expected to absorb some of the surplus had been substantially reduced.

The cutback concerns only virgin aluminum metal. Production of other aluminum products, such as sheet, extrusions, castings and forgings, is not in excess of consumption.

WPB Issues New Table Of Designations for Products

• • • **The WPB** on April 26 issued a new table of designations for 12 established classes of products, added three additional classes, removed one and set "freeze" periods on certain items, which restricts producers from altering shipping schedules when required to file delivery reports with WPB.

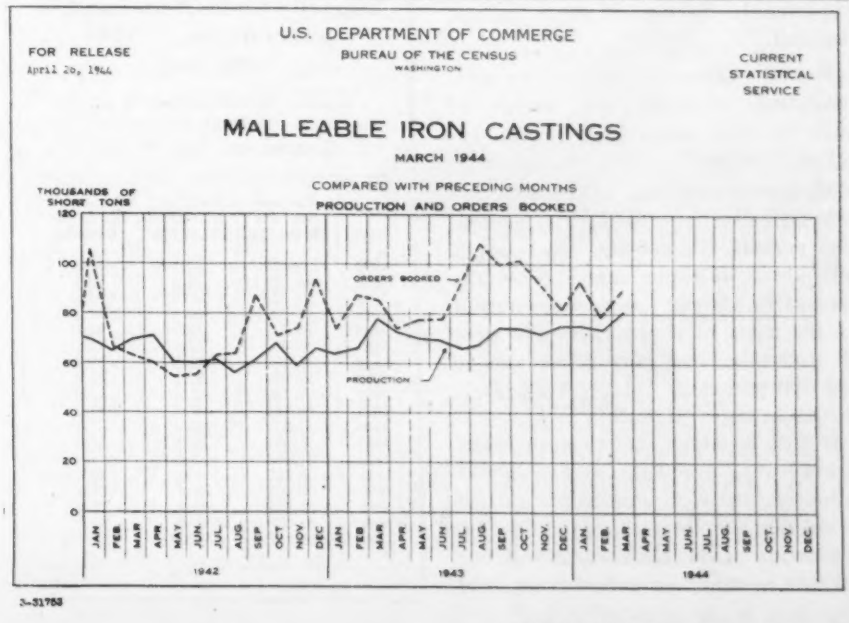
All products that were previously designated as "Y" or "Z" items have now been reclassified as undesignated or "X" Products. All "X" items require manufacturers to file periodic shipping reports unless specifically exempted by WPB. All items classed as undesignated are exempt from filing such reports unless specifically ordered by WPB.

Formerly "Y" products on this table required authorized purchase and delivery orders. "Z" items were subject to scheduling procedures from prime to the smallest sub-contractor in the instance of asembled products. This latter classification has now been dropped entirely from this table.

The new list, designated Table 6, as amended, to General Scheduling Order M-293, also excludes water distilling plants from the classification of heat exchangers.

WPB Widens Market For Excess Aluminum

• • • **Acting to** expedite the movement of idle inventories of aluminum, largely in the form of obsolete shapes and forms in the hands of airplane manufacturers, WPB recently issued a new order which permits persons not heretofore engaged in the business to acquire stocks from excess inventories and to dispose of them under regulations applicable to existing aluminum distributors. The new order, M-1-j, provides in addition that persons entering the business of aluminum distribution since April 1 of this year, may, when authorized by WPB, place orders with producers. A producer need not accept an order from a new aluminum distributor but if he does the order has the same status as one placed by an existing aluminum distributor.



Effect of Added Steel Capacity Upon Costs Being Weighed in the Industry

By TOM CAMPBELL
Pittsburgh District Editor

o o o

• • • **With total** steel capacity having risen to an unprecedented level of 93,650,000 net tons on Jan. 1, recent percentage of capacity figures, compared with those of former years, have become meaningless.

Just as such a tonnage was undreamed of a few years ago, so now is the ever-present worry, in the minds of some steel people, concerning the effect of such facilities on the future costs and trends in the steel industry.

Had the yearly increments in steel capacity progressed on a normal expected growth basis, the relationship between capacity and probable output would have followed somewhat the same pattern as it did the years prior to the present war. War demands, however, from this country and requirements from other United Nations, have been of such magnitude that the increases in both capacity and production are all out of proportion to normal growth.

In the opinion of many steel distribution experts, there probably will be a substantial bulge in steel production for rehabilitation purposes, after an inventory readjustment period has been completed. These authorities point out, however, that once the backed up or delayed needs have been taken care of, the country will probably settle down, for several years, on the basis of a normal growth. It is that period which many steel officials believe will bring into bold relief the excess of steel capacity over what is expected to be needed for a normal demand.

Recent figures, compiled by this magazine, covering the period of 1919 to 1943, show that in the so-called "normal" periods the average steel production was about 74.8 per cent of capacity. During the depression periods, the average steel output was about 40.3 per cent. Since the present war began, the average output on the basis of capacity at the time of production has ranged between 90 and 100 per cent. (IRON AGE, Nov. 18, 1943, pages 91 to 93.)

It is to be noted that these average figures were predicated upon the relationship between steel capacity and production, in the years in which the production materialized. Except for the war months, the period from 1919 to 1943 could be considered as an era which represented normal long-time growth, intimately tied in with population increases and technological changes. Had it not been for the war, it is hardly possible that steel production and steel capacity would have reached recent heights for some years to come, because the civilian economy would not have supported such a volume.

This opinion seems to be supported by the fact that in 1940, steel production was six per cent ahead of the previous peak year of 1929. In 1941, United States preparedness programs and lend-lease requirements forced steel production 31 per cent higher than 1929. Output of steel in 1942 advanced 36 per cent ahead of 1929, and in 1943 was 42 per cent ahead of the so-called banner year. Indications are that 1944 steel output will be about 45 per cent ahead of 1929. These figures, it is believed, make it fairly obvious that the growth in steel production and capacity, in the past few years, have been far beyond any increases which might have been due to long term growth.

Closely connected with the ultimate effect of the present steel capacity, upon the economy and financial position of steel companies, would be the comparison of output several years ago, not on the basis of capacity in those years, but on the basis of TODAY'S capacity.

In 1929, when 63,205,000 net tons of steel were produced, the industry operated at 88.5 per cent of its then capacity. However, on the basis of today's capacity, which is set at 93,652,000 net tons, the 1929 output would only be 67.5 per cent. In the relatively normal year of 1937, when 56,637,000 tons of steel were produced, the industry operated at 72.5 per cent of the capacity existing in that year. That tonnage, however, would only represent 60.5 per cent of today's capacity.

A scrutiny of percentage of capacity figures for years prior to 1940, serves fairly well as a criterion for the possible pattern in a postwar period. The figures themselves, however, if a clear view is to be obtained, should probably be readjusted, or at least qualified, on the basis that today's steel capacity is not the result of a normal growth but is much greater, due to war reasons. With labor costs and material costs having climbed consistently in the past few years, without corresponding increases in steel prices, and with there being a direct connection between present percentage of capacity operations and earnings, a study of operation rates, in previous years, while important, does not tell the complete story.

The chances are that even with rehabilitation, greatly expanded civilian needs, and strong efforts by the steel industry to utilize the greatest tonnage possible of its capacity, future percentage of capacity figures, over a long trend, will probably be lower than the pattern reflected in the years prior to the present World War.

The yearly average of steel output, during the 10-year period 1920 to 1929, amounted to about 47,800,000 tons. The first peak year in this period occurred in 1925, the second in 1926, the third in 1928, and the fourth in 1929. A study of the years 1936 to 1939 inclusive, which in some quarters have been interpreted as the so-called normal years, indicates a four year average of 48,700,000 tons a year. It seems apparent, based on a comparison of the growth from 1920 to 1929, with the period 1936 to 1939 inclusive, that output, during the present war period, is far above what would ordinarily be expected in normal growth.

Steel Production With Percentage Relationship Between Production for Each Year and Capacity for the Year and Capacity at Jan. 1, 1944

1926-1943

Source: American Iron & Steel Institute
Compilation—The Iron Age

Year	Tonnage Net Tons 000 Omitted	Per Cent of Capacity Each Year	Per Cent of Jan. 1, 1944, Capacity
1926	54,089	83.5	57.7
1927	50,327	74.9	53.6
1928	57,729	83.9	61.6
1929	63,205	88.5	67.5
1930	45,538	62.5	47.6
1931	29,059	37.6	31.0
1932	15,323	19.5	16.4
1933	26,020	33.1	27.8
1934	29,182	37.4	31.2
1935	38,184	48.7	40.6
1936	53,500	68.4	57.1
1937	56,637	72.5	60.5
1938	31,752	39.6	34.0
1939	52,799	64.5	56.4
1940	66,983	82.1	71.5
1941	82,839	97.3	88.4
1942	86,032	96.8	92.0
1943	88,873	93.1	94.7

Chicago District Heavy Producer of Carriages and Parts for Large Guns

Chicago

• • • **Special urgency** rating recently given the big gun program, placing it at the head of the list along with landing craft, has particular significance for the Chicago Ordnance District which produces the lion's share of the nation's heavy gun carriages.

Heavy forging facilities available in the East have concentrated production of large gun tubes there, but this region's preponderance of heavy traction equipment production facilities has made it a snug haven for manufacture of big carriages, recoil mechanisms, and equilibrators. One gun tube, the 155 mm., is manufactured, except for the tube forging, by the Chain-Belt Co., Milwaukee.

Special pride and joy of Milwaukee is the 240 mm. howitzer, the largest mobile artillery piece in United States service short of railway artillery, the carriage for which actually was designed and is produced at the Bucyrus-Erie Co. plant there. This carriage, which is basically similar to the 8 in. gun carriage, for which it is interchangeable with slight modifications, travels in two sections on rubber tired wagons. The 240 mm. howitzer has a range of more than 25,000 yd. Its barrel is 27 ft. long and enjoys as its companion a 25 ton self-propelled crane to lift it onto the carriage when the howitzer is put in place. Also, the leading producer of recoil mechanisms for the 240 mm. howitzer and 8 in. gun, Hannifin Mfg. Co., is in this area, and equilibrators for these pieces are made here.

Another native of the area bounded by the Chicago Ordnance District which has spent much of its production life here, is the 155 mm. "Long Tom" gun carriage. This carriage, which will, with modifications, also accommodate an 8 in. howitzer, is a pure American design, for which much credit goes to Col. Elmer C. Gobert of the Rock Island, Ill., arsenal and Jack Benns, chief of the Chicago Ordnance District Artillery branch. Contracts for this carriage were some of the first let in the Chicago district, and its production continues to be centered at Chicago plants of Pettibone Mulliken Corp. and Pullman-Standard Car Mfg. Co. The "Long Tom" is mounted on a split-trail carriage which permits 65 deg. elevation and 60 deg. traverse. The carriage is equipped with 10 giant pneumatic tires and air brakes and rolls along behind a prime mover traveling at the speed of a fast truck. This weapon, which Maj. Gen. L. H. Campbell, Jr., chief of Army Ordnance, calls "one of the most impressive and highly revered pieces of heavy artillery now in the hands of our troops," has a range of more than 25,000 yd. despite its low overall weight of about 30,000 lb. It fires one round a minute, and has a muzzle velocity of 2800 ft.-sec. The 155 mm. gun recoil mechanism is not produced in the Chicago Ordnance District, but the equilibrator is a district product. As mentioned above, the 155 mm. gun is manufactured in Milwaukee.

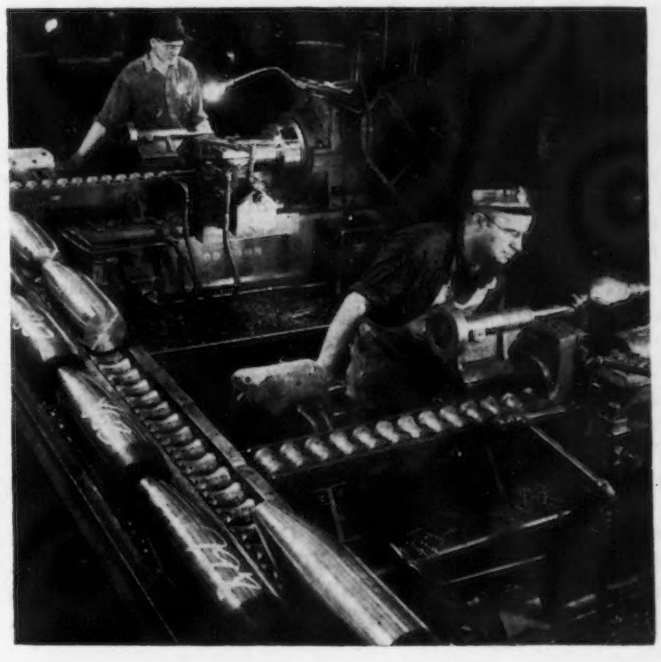
The 155 mm. howitzer carriage is manufactured by two district firms, Austin-Western Co., Aurora, Ill., and Link-Belt Ordnance Co., Chicago.

The big gun program currently is booming along in high gear, approaching the final slope of its production hump. The recent special urgency rating given the program means that it will be pushed ahead, but does not affect total steel requirements.

The big guns nicely supersede in the District's program the place formerly held by anti-aircraft gun mounts, which, in 1943, amounted to a sizable percentage of the grouping of 13,159 gun and howitzer carriages, anti-aircraft gun mounts, and trench mortars produced on Chicago Ordnance District contracts.

Some idea of the role which artillery will play in combat plans may be judged from the nation's artillery ammunition program which late in 1943 was announced as 282 per cent of 1942 production. Production in 1943 was 170 per cent of 1942. In this district, four companies produce the 155 mm. shell, and a contract has just been placed for 8 in. shell manufacture.

o o o



HEAVY EQUIPMENT: *Designed, developed and manufactured in the Chicago region are carriages for the 155 mm. gun shown below. The gun tube of this "Long Tom" also is manufactured, except for the tube forging, in that region. Ammunition for the 155 mm. gun is produced on mass production basis in a Chicago area plant.*

o o o

War Leaders Testify at Length; Fight to Aid Small Business Faces Test

Washington

• • • **Two days'** hearings last week before a subcommittee of the Senate Small Business Committee studying the reconversion problems of small business revealed that Senator Kenneth S. Wherry, Republican of Nebraska, will have to continue waging his one-man campaign for full utilization of the nation's resources with small business getting its fair share.

This crack in the Senate Small Business Committee does not find Senator Wherry and the committee chairman disagreeing on principle. The difference arises over WPB authority. For example, Senator Murray, Democrat of Montana, Chairman of the Committee, would be willing to turn over the entire reconversion job to WPB Chairman Nelson, while Senator Wherry is having difficulty mustering support for his bill which would divorce SWPC from WPB.

During several heated exchanges Mr. Nelson told Senator Wherry that the Senator did not understand the workings of WPB, when the Senator proposed taking SWPC away from WPB. The Senator later told THE IRON AGE that it is quite evident that Mr. Nelson is trying to run the whole show and that the WPB chief's statement that small business had gotten all that was possible to get in the way of war contracts was "the most flagrant thing I've ever heard."

The subcommitte's sessions took on the form of a four-act play. In the first act Undersecretary of War Robert P. Patterson took a firm stand against any increase in civilian production. Mr. Patterson also told the committee that mobilization for war had aided small business, citing puzzling statistics to prove his point. Senator Wherry challenged Mr. Patterson regarding the accuracy of the latter's figures.

Act 2 found Undersecretary of the Navy James V. Forrestal telling the committee that small business had shared in Navy contracts to a large degree, but that no civilian production could be stepped up due to Navy cutbacks, since the Navy has not as yet reached its peak of production.

In Act 3 Mr. Nelson substantially reversed his position taken previously before Senator Murray's Military Affairs subcommittee on the Murray-George Contract Termination bill. After receiving the approbation of Senator Murray and his group Mr. Nelson refused to come through with any support for Senator Wherry's ideas for aiding small business and furthering reconversion.

Apearing in Act 4 were A. C. C. Hill, Jr., acting WPB vice-chairman for the Office of Civilian Requirements and Col. C. R. Baxter, director of the WPB Redistribution Division. Mr. Hill did not make as valiant a fight for increasing civilian production. Col. Baxter in a forthright presentation told the committee of his operation and his plans for stepping up civilian production.

Senators Wherry and Stewart pointed out on several occasions that they realized the necessity of maintaining war production, but that they wanted to see small business get its share of civilian goods manufactured as soon as any facilities are available, without any artificial barriers.

Contrary to earlier reports from the Army, Mr. Patterson told the Committee that, "when War Department procurement, as projected ahead for the balance of the year, is looked at as a whole, it will be found that, so far as we can now predict, there will be no over-all reduction. In many items there will be a large increase." The accompanying table shows that the Ordnance and Medical Departments are the only two in which 1944 production will show a decline.

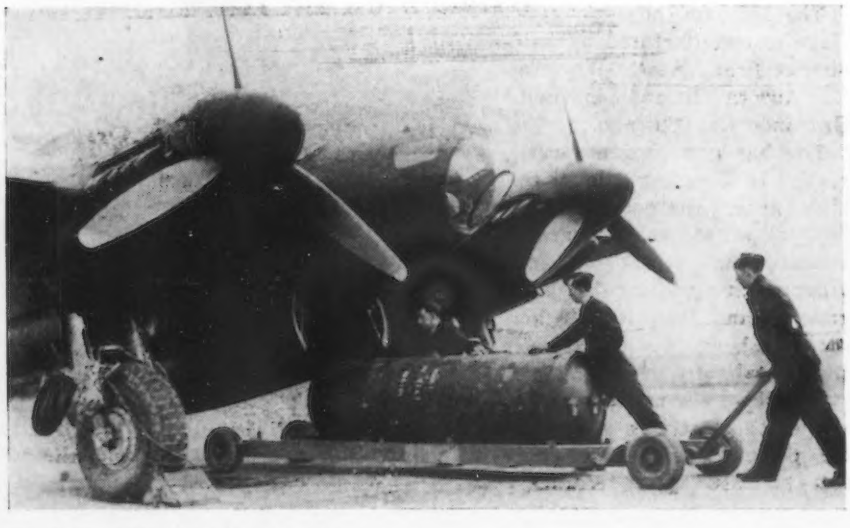
Conversely, Justice James F. Byrnes, director of the Office of War Mobilization, has stated that Army and Navy cutbacks will total $18,000,000,000 this year. Considering that a large portion of this amount will be in production shifts, there would still be about $4,000,000,000 actually cut back.

In stating the effect of War Department policy on small business Judge Patterson said:

"The failures of manufacturing concerns in 1942 were the lowest in a number of years; while in 1943 there were only one-third as many as in 1942. The record for the eight months ending March 1, 1944, is uniform and is at the lowest point in a 20-year record. As small business concerns always accounted for most of the failures, the conclusion is inescapable that mobilization for war has not only injured small business, but has strengthened its stability and profits."

Senator Wherry took sharp issue with this statement. The Senator said that the figures presented by Mr. Patterson included only manufacturing concerns and only those that failed, but did not include those that had to voluntarily retire from the business field, nor the wholesale and retail concerns that were eliminated. Presenting Department of Commerce figures the Senator pointed out that 540,000 businesses had closed their doors since December 1, 1941, and that no new businesses have started up. The Senator said "this is the real impact of war on small business." Mr. Pat-

BLOCKBUSTING MOSQUITO: *This plane has a real sting now. Photo shows the loading of a 4000-lb. bomb in this famous ship.*



terson admitted that Senator Wherry had presented the true picture of the war's impact on small business.

Continuing Mr. Patterson pointed out that in 1943 151,597 supply contracts were placed with firms having less than 500 wage earners. This amounts to 62.8 per cent of all contracts placed by the War Department aggregating 12.6 per cent of total dollar value, or nearly $4,500,000,000. He said this total would be greater if small plants were able to participate more fully in the aircraft production programs.

The Undersecretary indicated that this was only a part of the true picture, since innumerable subcontracts found their way into the hands of small business. Although the War Department keeps no accurate statistics on subcontracts from a check survey made at the request of SWPC about a year ago, it appeared that 36 per cent of the dollars awarded to large plants found their way directly or indirectly to subcontractors or suppliers in the small plant category. Adding this to the 12.6 per cent directly awarded by the War Department to small plants, Mr. Patterson said, "it appears that nearly 50c of each Army dollar goes to plants employing less than 500 persons."

Taking issue with this statement Senator Wherry brought forth an admission that perhaps this estimate was too high. The Senator said that he felt that the present percentage of the dollar value was not a fair share for small business and that more could be obtained if procurement policies were better coordinated.

Mr. Patterson stated that large contractors who are cut back are urged by the War Department not to cut their subcontracting volume to small plants by an amount greater proportionately than their own reduction, but admitted that the War Department could not enforce this policy. He said that it is impossible to keep a record of all subcontractors engaged in War Department work, and also to trace the effect of cutbacks on all subcontractors. It was his belief that only a central agency, such as WPB, can evaluate the effects of cutbacks through the tiers of subcontractors and perceive the indicated trends.

In a rather important statement of policy the Undersecretary said, "no discrimination as to release of plants from war production by the War Department will be made in favor of large plants or at the expense of small plants. It will be our policy, so far as other factors permit to give first priority of release from war production to privately owned plants which have not normally engaged in production of military character."

WPB chairman Nelson in a discussion of the plight of small business said, "We owe it to small business to see that it is reconverted first."

Judge Patterson claimed no advance of knowledge of the recently issued and revoked Staff Memorandum No. 42, which would have cut back civilian production in Group I and II labor areas to first quarter levels without regard to individual factors, but said that from what he read in the newspapers he agreed in principle with an order of this type.

When he said that there should be "no increased civilian production anywhere so long as a labor shortage exists anywhere in the country" he startled both the committee and spectators. He did not elaborate as to who would make such a decision, nor did he attempt to evaluate the effect of such a policy on the nation's economic structure.

Undersecretary of the Navy Forrestal told the committee that no great amount of capacity for civilian production could be made available through Navy cutbacks since Navy procurement had not yet reached its peak. He asked for assistance for small business in the reconversion period.

Although dollar value of Navy production is classed as secret, Mr. Forrestal presented the following index to show the Navy's plants for 1944:

4th Quarter 1943 = 100
1944

	1st qu.	2nd qu.	3rd qu.	4th qu.
Bureau of Ships	89	105	102	96 or 106
Bureau of Aeronautics	109	119	134	148
Bureau of Ordnance	125	134	138	139
Bureau of Yards and Docks	108	115	118	118

The Undersecretary said a decline is possible in 1945. He said that small plants participate in all Navy procurement. Half of the Navy primes are placed with firms employing 500 or less, and about 10 or 12 per cent of the dollar value, based on the fourth quarter of 1944, goes to such plants, according to Navy figures. Total delivery from small plants run as high as 20 per cent of total procurement in some lines. About 20 per cent of the number and 25 per cent of the dollar value of the first tier of Navy subcontracts go to small business.

Mr. Hill said that unrestricted pro-

ARMY SERVICE FORCES PROCUREMENT

(Amounts in Millions of Dollars)

Technical Service	1943 Actual	1944 Requirements	Actual and Projected Quarterly Schedules—1944				Peak Quarterly Output	
			First	Second	Third	Fourth	Amount	Quarter Attained
Total—All Services	23,135	23,571	5,918	5,837	5,994	5,736	6,306	Fourth—1943
Ordnance Department	12,672	11,001	2,858	2,733	2,722	2,601	3,306	Third —1943
Signal Corps	2,887	3,407	883	888	836	762	972	Fourth—1943
Corps of Engineers	1,475	1,830	413	427	523	473	523	Third —1944
Chemical Warfare Service	517	849	170	232	242	190	242	Third —1944
Medical Department	388	278	69	50	50	46	123	Second—1943
Quartermaster Corps	4,643	5,081	1,290	1,217	1,318	1,395	1,395	Fourth—1944
Transportation Corps	533	1,125	235	290	303	269	303	Third —1944

Note—The dollar values shown above are based on constant unit costs (as of Aug. 1, 1943) and therefore reflect the physical quantity of deliveries rather than the cost from a fiscal viewpoint.

duction of many items, necessary to the civilian economy, could be had if small plants were given full opportunity to produce. He added that there is no conflict with the Army on the definition of essential items, but that such a conflict existed on how to produce these items and in what quantities.

It was Mr. Hill's feeling that essential civilian production could be had in all labor areas without interfering with war requirements or manpower needs. He added there was intention on the part of WPB to give uneconomic quotas to small business, but apparently the committee felt that he was protecting WPB in making this statement. OCR programs are being held back by WPB because of lack of facilities, according to Mr. Hill. He said that some small plants are now producing 100 per cent of their output for civilian use.

Mr. Nelson said any new order of the type of revoked Staff Memo 42 would not be quite so rigid and would be handled locally. The WPB chairman said there would be no appreciable increase in civilian goods output until the European phase of the war was over.

This statement brought the observation from Senator Brewster of the Truman Committee that the Truman group would investigate this situation since it runs counter to the committee's recommendation that civilian goods production be increased as soon as facilities and manpower are released from war production, without the imposition of any artificial bonds.

In reply to Senator Wherry's claim that the food program was suffering because farmers could not get supplies of new equipment or even repair parts to keep old equipment running, Mr. Nelson said that 5300 tractors are now being produced weekly, or double 1943 output, and that production of repair parts was 167 per cent greater than the industry's peak year. He did not say how much of this actually reached civilians. Senator Wherry asked for substantiation of this claim, since daily complaints from farmers pour into the Senate. The Senator said that in Nebraska 800 farmers put up more than $150,000, or about $185 each toward the purchase of one used tractor.

Col. Baxter said that at the end of March this division listed 300,000 tons of available steel, while in the previous two-week period 50,000 tons had been sold, while 70,000 tons were taken in.

For the same period 20,000,000 lb. of copper were available, while in the previous two week period 1,128,000 lb. were sold, and 2,083,000 were taken in. In aluminum, 7,000,000 lb. were listed and 2,250,000 lb. sold in the two week period.

In the miscellaneous classification, mainly machinery, 38,000 items were listed, with $625,000 being sold during the same two week period. In March machinery referral figures had risen to $7,250,000 weekly and held that level for a month.

Monthly Shipping Schedule Required for Class X Products

Washington

• • • **Provisions of** General Scheduling Order M-293 have been modified to clarify the status of Class X products, WPB announced. Manufacturers of Class X products are required to file monthly shipping reports unless specifically exempted by WPB.

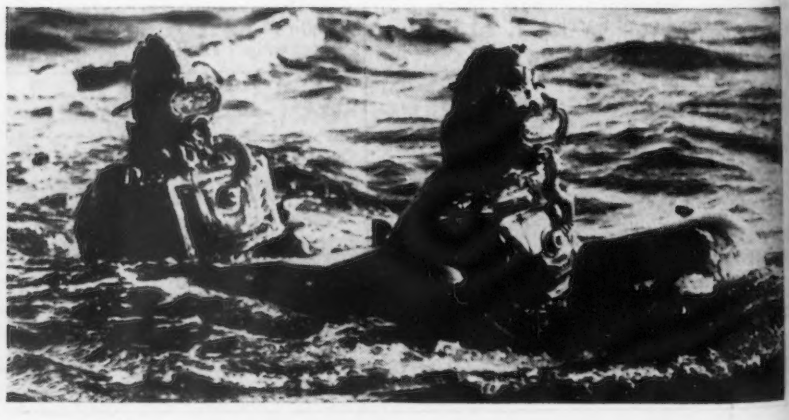
The amended order requires that Class X product shipping schedules as filed with WPB shall cover shipments to be made on and after the first of the month following the date of filing. Schedules submitted during a month will not cover shipments for the remainder of the month in which they are filed since such shipments are covered by previously filed schedules.

The amended order still provides that shipping schedules become frozen on the date they are filed. However, if a manufacturer is excused from filing his schedule, it becomes frozen on the date he would file if he were not excused, and the freeze period in no event exceeds two months.

In filing a shipping schedule for Class X products with WPB, a manufacturer need not include all purchase orders received by his sales department up to the time of the filing. To allow himself sufficient time to prepare his shipping schedule, the manufacturer need include in his schedule only those orders that were received up to a date that he may choose prior to the date he has to file his schedule with WPB.

o o o

LATEST STYLE SUIT FOR HUMAN TORPEDO: *The specially designed diving suit worn by the "human torpedoes" of the Royal Navy is shown at left. Other photo shows two of the men in action.*



Navy Salvage Plan Will Yield Savings of $100 Million by End of 1944

Washington

• • • **Operating back of** the fleet in a score of war theaters, the Navy has some 500 officers and civilians engaged in salvage work. By stripping every damaged machine of war and by collecting all other usable equipment and material, trained crews make it possible for fighting ships of the air and water to return quickly to action, on which victory and lives are dependent.

The Navy's primary function is to win battles and keep sea lanes open. Economy is secondary. But economy has played an important role in the present salvage program, which began on a small scale in 1941. This is made clear by the Navy's estimate that by the end of 1944 savings will exceed $100,000,000.

This work is done by the Material Redistribution and Disposal Branch, a part of the Bureau of Supplies and Accounts. Chief of the Bureau is Rear Admiral William Brent Young, who is also Paymaster General of the Navy. Commander Jack G. Dean heads the branch.

To effectively correlate the entire salvage program, Admiral Young authorized the issuance of a *Salvage Conservation Handbook*, prepared by the Salvage Conservation Section. The handbook became the guide for the Navy in handling and disposing of all types of salvage material. A *Navy Color Chart* for the segregation of critical metals was also devised and has received wide acceptance in other government agencies and in industry.

The Bureau of Supplies and Accounts has established 14 Material Recovery Units at overseas bases. They are located in or near principal combat zones. The crews, trained under the direction of Commander Dean and his staff in Washington, swiftly appraise a vehicle of war, select equipment that can be reclaimed and get it back into service.

In the early phases of the war the salvage crews endured far more than they do today. Then there was no time for salvage work. Because there was no time, there were no warehouses or ships at the off-shore stations. Soon after the outbreak of hostilities, however, the pressing need for scrap to feed steel plants and foundries caused the various agencies to institute a campaign of collection both in the United States and abroad of old material and regulate its distribution. The Navy joined in the effort, gathering not only scrap of all kinds, such as ferrous and nonferrous metals, rubber, plastics, textiles and other materials but all sorts of replacement parts and accessories.

In the battle areas the Navy material recovery crews show the result of their special training. As soon as the beachhead is reasonably secure, or an invasion force has started to move inland, an officer surveys the area and compiles a report on how much reclaimable material exists. The report is transmitted to the nearest crew which

(CONTINUED ON PAGE 149)

o o o

GOING BACK TO WAR: *Top photo shows cannon from an old Spanish battleship captured by Admiral Dewey, being loaded on a truck for scrap. Eventually the metal will be used against the Japs. Bottom photo shows old submarines and coastal ship sold at Philadelphia for scrap in 1942.*

o o o

OPA Places Imported Ferrous Scrap under Maximum Price Ceiling

Washington

• • • **Effective May 5,** OPA through an amendment to the iron and steel scrap schedule brought imported material under the maximum prices in effect for domestic scrap. After consultation with WPB, Metals Reserve Corp., FEA, and the Industry Advisory Committee, OPA eliminated the procedure that required prior approval of two government agencies before purchases could be made, OPA established prices at the domestic level, f.o.b. port or point of entry. Formerly imported scrap was not covered by specific dollars-and-cents maximum prices and it could not be purchased unless the buyer first obtained OPA approval of his price and also WPB approval.

Under the new procedure, the shipping point is defined as either:

1—The port of entry, when the scrap is imported by vessel; or

2—The point of entry—that city at or nearest the point where the carrier crosses the border between the United States and the foreign country from which the scrap was exported—when the scrap is imported by other than vessel movement.

Once the shipping point has been established, the price is fixed in accordance with the procedure set up by the schedule for all scrap shipped from that point.

The amendment also adopts the American Association of Railroads specifications for rerolling rails, a step taken after consultation with the industry advisory committee and the Rail Steel Bar Association. The new specification eliminates from the rerolling classification types of rails unsuited for rerolling and not normally used by the rerolling industry.

PD-1-a Users Get New Instructions

Washington

• • • **Applicants for priority** assistance who normally use WPB form 541 (formerly PD-1-a) for the acquisition of equipment or materials other than controlled materials were issued new instructions this week by WPB for filing this form.

Effective May 1, 1944, and applying to the use of form 541 only, applicants are advised to continue the use of the old form identified by the printing date 7/6/43 which appears in the upper left hand corner.

However, they are advised to be guided by the following revised instructions:

Applications for Project Ratings

In line with certain exceptions permitted under Direction 2 to Conservation Order L-41 and Controlled Materials Plan Regulation 5 and 5A allowing the installation without specific authorization of minor capital additions and processing equipment or machinery, the instructions on page 4 of WPB Form 541 under the heading "Applications for Project Ratings" has been amended to read:

"Under Conservation Order L-41, authorization is required to begin any construction, including additions and installations, the cost of which is above certain dollar limits. Below these dollar limits, construction may be carried on without any specific authorization from the War Production Board. WPB form 541 may be used to secure preference ratings on materials or equipment for construction which is below the dollar value requiring authorization under Order L-41. For all construction exceeding the dollar limits specified in Order L-41, WPB form 617 (formerly PD-200) must be filed for authorization to begin the construction and for a preference rating and allotment of controlled materials."

Applications for Materials for Export

When exporters or foreign applicants are applying for both an export license and a preference rating to obtain material for export, Foreign Economic Administration form FEA-419 only should be used to obtain both the preference rating and the export license. However, when a valid export license has already been issued to cover the materials, and only a preference rating is necessary, exporters and foreign applicants are to use WPB form 541, omitting the answers to questions 6b, 13, 14, 15g, 16, 18b, 18c, 18d, and 18f.

Applications for Equipment

Many WPB orders require specific authorization for the acquisition, sale or delivery of equipment to be obtained on WPB form 1319 (formerly PD-556). The WPB form 1319 instruction booklet (obtainable at any WPB office) lists the items released on the form, and these items should not be applied for on WPB form 541. If a preference rating is required, it will be assigned on WPB form 1319 and a separate application on WPB form 541 is not required.

Applications by Individual Consumers

Reference to form WPB-2631 (formerly PD-851) in the second paragraph, "Applications for Civilian Plumbing and Heating Equipment," has been changed to read "WPB form 1319 (formerly PD-556)."

Priority Changes

Agriculture implements — Preference has been given to agricultural machinery items and to repair parts. L-257, as amended. (4-26-44)

Aircraft—An additional type of indicator light has been added to the Table of Acceptable Assemblies accompanying the order covering aircraft lighting equipment. L-327, as amended. (4-25-44)

Aluminum—The restrictions on the use of aluminum and zinc in nuts, bolts, washers, and name and identification plates have been lifted and aluminum, but not zinc, finishing or plating of cases is permitted. L-273, as amended. (4-26-44)

Anti-friction bearings—WPB is modifying its very rigid control over the scheduled deliveries of anti-friction bearings in order to care for sudden and unexpected adjustments. The adjustments, however, will be strictly limited. Form WPB-3333, Supp. 1. (4-27-44)

Disks—The manufacture of cutaway disks and coulter blades that are to be used for any purpose other than for brush and bog harrows has been restricted. Dir. to L-257. (4-24-44)

Iron castings—Inventory restrictions on malleable iron castings have been modified. Amdt. to M-21-i. (4-27-44)

Iron castings—Delivery of malleable iron castings has been limited. M-21-i. (4-26-44)

Priority regulation No. 3—The bi-monthly revision of priorities Reg. No. 3 and three interpretations of the regulation have been issued. (4-27-44)

X products—Manufacturers of class X products are required to file monthly shipping reports unless specifically exempted by WPB. The status of these products has been modified. Sched. M-293. (4-26-44)

Zinc and tinplate—Some zinc and tinplate may be used in the production of church items. L-136, as amended. (4-26-44)

Renegotiation Filing Requirements Eased

Washington

• • • **Simplification of the** mandatory filing requirements for certain war contractors and subcontractors subject to the Renegotiation Statute has been provided for by a ruling released recently by the War Contracts Price Adjustment Board.

The ruling states that parent and subsidiary companies may satisfy the requirements for filing a mandatory form of report by doing so on a consolidated basis.

Subsidiaries having renegotiable business must file the standard form of Contractor's Report made public by the board several weeks ago, but may complete the report simply by writing on it a statement that the information called for is contained in the consolidated report filed by the parent company.

In response to inquiries from contractors, the board announced that no special forms have been or will be prepared on which to make application for exemption of standard commercial articles from the provisions of the Renegotiation Statute. Standard commercial articles vary too widely, the board pointed out, to make it feasible to prepare a form which would be suitable for all applicants.

Similarly, no form has been or will be prescribed for filing of applications for refunds under the retroactive application of the statute's provision exempting from renegotiation socalled excess inventory profits; that is, profits attributable to increases in the value of inventories in excess of amounts that would reasonably be required for the performance of war contracts.

Uses Studied for Reinforcing Steel

• • • **A basic study** of the uses of steel bars for concrete reinforcement is being inaugurated by a committee on reinforced concrete research recently organized by the American Iron and Steel Institute. Membership of the committee includes representatives of 21 producers of both new billet and rail steel concrete reinforcing bars.

To plan and supervise the investigations, R. R. Zipprodt has been employed as research and consulting engineer.

The committee has outlined an initial program of work covering a minimum of three years. In general, it is planned to study the extent of any gaps which may exist in the technical data on which design regulations and specifications are customarily based. It is then proposed to initiate programs of research for the purpose of developing new test data or of supplementing existing data.

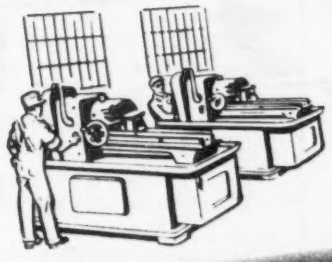
Several research projects already have been authorized. Work is under way on a comprehensive investigation of problems relating to the proper design of square and rectangular footings. No research work pertaining to the design of footings has been reported since 1913. Since then many major improvements have been made in materials utilized in reinforced concrete construction.

A second project will involve the investigation of unit stresses permissible in the design of reinforced concrete slabs and beams. The study aims to determine the extent to which the ratio of slab thickness to span affects the unit stresses in the slab and consequently its deflection. It will also investigate the extent to which the span of slabs or beams should be limited by the size or type of reinforcement used. A collateral phase of that project will be a study of the effect of plastic flow, particularly on structural members subject to their own dead weight as well as uniformly distributed live loads.

Classification of all types of deformed bars which may be developed as a result of the concrete reinforcing bar industry's purpose of developing a standard or universal type of deformed bar will be covered in a third project.

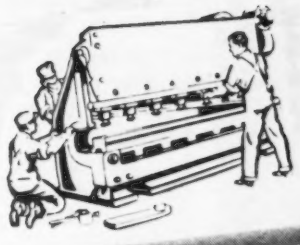
THIS NEW LUBRICATION PLAN Provides a *3 Way Saving!*

① SAVES EQUIPMENT



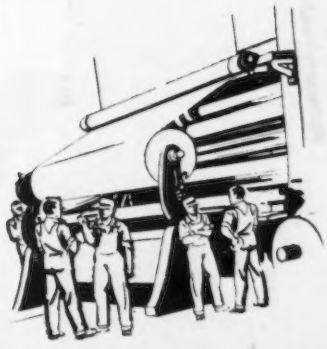
Today, with many types of equipment almost impossible to replace, conservation through proper lubrication is of prime importance. Sun's SAVE and SERVE Plan has been developed to help you make the equipment in your plant run better and last longer . . . by helping you establish a system of proper lubrication.

② SAVES PRODUCTIVE TIME



Every breakdown of equipment wastes productive time. Sun's SAVE and SERVE Plan helps you cut down these wasteful periods — when valuable machinery must stand idle unnecessarily — and increases the actual productive time you can expect from your equipment.

③ SAVES LABOR



Reduce your maintenance time . . . cut your repairs and you save manpower.

Sun's SAVE and SERVE Plan will help you do both — help you make every man-hour a productive hour — by giving you a guide to correct lubrication that anyone can follow. Put Sun's SAVE and SERVE Plan to work in your plant. No charge. It's yours for the asking — includes plant poster, wall chart, lubrication manual, technical bulletins, maintenance memos. Write for folder giving complete details . . .

SUN OIL COMPANY, Philadelphia 3, Pa.

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

Send in Coupon Today!

No Obligation.

SUNOCO

SUN INDUSTRIAL PRODUCTS

Helping Industry Help America

SUN OIL COMPANY
1608 Walnut Street
Philadelphia 3, Pa.

IA 2

Send folder describing your SAVE and SERVE Plan.

NAME: .....

TITLE: .....

COMPANY: .....

ADDRESS: .....

Olds Reports on Shipments, Income

• • • **Shipments of** finished steel products by the U. S. Steel Corp. in the first quarter of 1944 amounted to 5,361,354 net tons, slightly below the all-time quarterly record of 5,367,088 net tons shipped in second quarter of 1942, Irving S. Olds, chairman announced April 25. For the comparable period last year, 5,149,982 tons were shipped.

Production of steel ingots and castings in the first quarter of 1944 averaged 96.5 per cent of rated capacity, a quarterly tonnage peak. Mr. Olds' remarks on labor were reported last week, page 87.

Income for the first quarter of 1944 after all costs, including allowance for taxes estimated on the basis of the 1943 revenue act, amounted to $17,027,616, an increase of $1,621,019 over the reported income for the first quarter of 1943. Quarterly dividends of $1.75 per share on preferred stock and $1.00 per share on common stock were announced simultaneously.

Net current assets of the Corporation and its subsidiaries at March 31, after deducting the current dividend declarations, were $541,645,224, compared with $537,609,059 at the end of the first quarter last year.

Fluorspar Output at Peak Of 433,000 Net Tons in 1943

Washington

• • • **Production of** finished fluorspar during 1943 amounted to 405,600 net tons, according to the Bureau of Mines. In addition, 65,000 tons of crude ore equivalent to 27,400 tons of finished spar were mined but not milled during 1943. Thus, total production expressed in terms of finished fluorspar was 433,000 tons in 1943 as compared with 337,000 tons in 1942. The Illinois-Kentucky district accounted for the bulk of the production, producing 75 per cent of the total in 1943 and 79 per cent in 1942.

Consumption reached an all-time high in 1943 of 388,885 net tons, compared with 360,800 tons in 1942. Steel mills continued to be the prime users, but total consumption used by the steel industry in 1943 was 3 per cent less than in 1942 notwithstanding the 4 per cent increase in total steel production. In 1943, steel producers used 233,912 tons of fluorspar, as against 242,600 tons consumed in 1942. Iron foundries and ferro-alloy producers together consumed 7260 tons in 1943 and 7800 tons in 1942.

A Quiz FOR OPERATORS and OWNERS of SCREW MACHINES

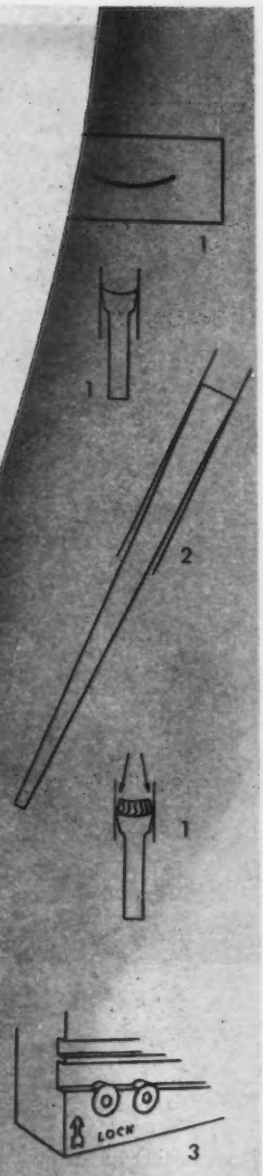
What cut-off blade[1] has hollow ground top which permits chip to leave cut with reduced friction against sidewalls?

What cut-off blade[1] is T-shaped to provide side clearance?

What cut-off blade[1] is built with taper[2] along longitudinal cutting width to provide constant back clearance through repeated sharpenings?

What cut-off blade[1] causes chip to collapse, thereby allowing coolant to actually reach cutting edge?

What cut-off blade[1] uses a holder[3] that permits removal of blade without disturbing original set up?



BUY MORE WAR BONDS

Also manufacturers of Empire Floating Tool Holders and distributors of Fastcut Centerdrills and Keyseat Cutters.

ANSWER—Empire Tool Company's Luers Patented Cutting-Off Blades[1] and Holders[3]. [2]Blades parallel to longitudinal cutting width also available. Both tapered and parallel shipped immediately from stock.

Send for catalog

PRODUCED UNDER LICENSE ISSUED BY JOHN MILTON LUERS PATENTS, INC.

EMPIRE Tool Co.

8788 GRINNELL AVENUE
DETROIT 13, MICHIGAN

X-Rays Control Hot Mill Sheet Gages

Philadelphia

DR. W. D. COOLIDGE

• • • White-hot sheet steel, at temperatures as high as 2000 deg. F. and moving 1750 ft. per min, as it emerges from a rolling mill can have its thickness accurately measured by X-rays. This new development was revealed by Dr. William D. Coolidge, vice-president in charge of research for General Electric Co., in his acceptance of the Franklin Medal, awarded by the Franklin Institute.

Dr. Coolidge told his audience that "X-rays may be used as a thickness gage without the necessity of making mechanical contact with the work as, for example, in the rolling of sheet steel."

With an X-ray outfit below and an ionization chamber or other X-ray intensity measuring device above the sheet, it is possible through the measurement of X-ray transmission to have a constant indication of thickness and, if desired, to have the X-rays themselves control the mill so as to maintain automatically a constant thickness of the steel sheet.

By a new method, Dr. Coolidge said, it is now possible to extend the available range of X-rays up to those corresponding to 100 million volts. Yet in the other direction, by the use of a beryllium window in the tube, it is possible to render available X-rays at as low as 1000 volts.

High voltage X-rays are important in today's industry, making possible radiographic examination of various kinds of war materials including welds and steel castings as thick as 8 in. The main advantages of high voltage X-rays over low voltage rays is in their penetrating power and correspondingly shorter exposure times, and they reduce contrast in the radiograph, making possible the study of a single film of a specimen of widely varying thickness. A single 1,000,000 volt radiograph gave information throughout the thickness range of 0.25 to 12 in. in a casting that required 19 exposures at 200,000 volts.

Agencies Combat Firms Selling Service Of Skilled Workers

Washington

• • • **A program for** combating so-called "engineering service" companies which purport to provide engineering service to war contractors but actually operate as brokers supplying skilled labor at exorbitant rates was jointly announced by the National War Labor Board, War Manpower Commission, War and Navy Departments, and Maritime Commission as a result of conferences between representatives of these agencies who have for some time been studying the practices of some of these companies. Individual plans of action have been drafted by WLB, WMC, and by the War and Navy Departments and Maritime Commission.

The actions of these agencies are not directed at companies to the extent that they give legitimate engineering advice and technical assistance. They are concerned with the so-called "engineering service" companies which render little, if any, engineering service, but really serve as labor brokers supplying skilled workers for excessive fees, a practice which increases the cost of war production, tends to cause labor unrest, and reacts against the wage stabilization and manpower control programs.

The companies usually contract with highly-skilled workers for their services, draining them from the regular labor market, and then sell services to contractors at hourly rates higher than those that the contractor himself is permitted to pay under the wage stabilization program.

The plans call for establishing stabilized rates that can be paid such workers and imposing penalties against violators; denying and controlling hiring privileges; and the exercise by the War and Navy Departments and the Maritime Commission other controls as are available to them.

The WLB's program follows:

1—The regional boards will continue the work already begun of defining the major job classifications used by such companies and of establishing appropriate wage rate brackets or maximum wage rates for these classifications.

2—When these brackets or rates have been fixed, the regional boards will publish them as stabilized rates for the classifications covered. In addition, the regional boards will send special notice of these brackets or rates to employers with whom the service companies may have contracts and to the procurement agencies having contracts with such employers.

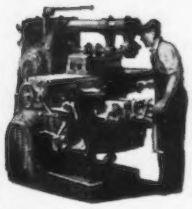
3—At the same time, and perhaps as

Will your products be on the Salesfloors of the better Dealers tomorrow?

What will your †† future **I.P.** *be?*

This is the Fifth of a series of advertisements presenting "Industrial Par" and its importance to your company in all future planning. Save this and succeeding I.P. advertisements as the basis for discussion and as a guide to your planning program.

. . Your Company's **I.P.** May Be The Deciding Factor



THE return to peacetime production won't be accomplished without industrial "casualties"—every realistic business thinker knows that some mortality is inevitable in such adjustment.

Farsighted planning now will enable many companies to carry on and through — they will re-establish and hold places for their products on sales floors of the better dealers tomorrow.

Such planning recognizes that there will be many problems beyond the control of management — to be met as they arise with immediate resourcefulness. Well-conceived, thorough postwar plans of action concern themselves properly with the known factors—the anticipated trends of the peacetime future.

It is a certainty that even well-known, long established industrial firms will encounter new competition — new, aggressive organizations, unfettered by any traditional methods of manufacturing and marketing, who are determined to challenge the places which older, prewar companies believe they hold in the industrial world.

And it is another certainty that buyers in the postwar world won't differ materially in their usual habits — they will want values for their dollars, not mediocre products at de luxe prices. Those manufacturers, whether entrenched or newcomers in a given market, who are best equipped to provide better products at attractive prices can expect to fare best in the coming battle of competitive production. To make better products—at lower cost—will demand production-engineering skill implemented with the best modern machine tools.

Such production has its roots in man-hour output. Only by maintaining or excelling our expected national *industrial par* can we attain security of jobs and wages for the greatest number of workers. The vital significance of *industrial par* to industry is summarized in the panel headed "Spotlight Facts for Your Future I.P. Planning."

In the new competition — postwar — the farsighted manufacturer will look to the most modern and advanced machine tools as the most effective means of maintaining *industrial par* and its benefits in terms of employment — better production at lower cost.

Let's all Back the Attack! **BUY MORE BONDS**

Spotlight facts for your future **I.P.** *planning*

* Production methods — developed in wartime —increase man-hour output; pent-up buying power — released in peacetime — demands increased production.
* The rate of 2½% increase per year output per man-hour, established by a 42 year record of industrial production, can be expected to reach at least 4% per year — compounded.
* Manufacturers must set a goal of 50% increased output per man-hour every 10 years — to maintain a high level of national prosperity and achieve its benefits in terms of security of jobs and wages for the greatest number of workers and the volume production of more goods for more people at lowest cost.
* Machine tools — the most modern, most efficient — are recognized as the most effective implements of mass production and increased output at lowest cost — but only continual replacements with the newest and finest machine tools assures full productive capacity. *Such replacements yearly should be equal to 10% of the total machine tool investment — in keeping with increased output.*
* The cost of machine tools is insignificant in terms of their productive power . . . from 1927 to 1937, according to census reports, American manufacturers had only a total of about 2% invested yearly in machine tools in ratio to a total volume of 9 billion dollars' worth of production annually.

†† **Industrial Par** — *the constantly increasing output per man-hour equal to approximately 50% every 10 years.*

KEARNEY & TRECKER
CORPORATION
MILWAUKEE 14 WISCONSIN

Milwaukee Machine Tools

a part of the schedule of job classifications and wage rates, the regional boards will establish and announce appropriate regulations governing additional payments for out-of-town work by employees of the service companies.

4—The enforcement attorneys of the regional boards will continue the investigations they are now making of alleged violations of the stabilization program by these service companies and will bring to the attention of the regional boards any evidence which may warrant enforcement proceedings against such companies.

Any illegal wage or salary payment may be disallowed by the government as a legitimate expense of the employer when calculating deductions under the revenue laws, or when determining costs or expenses under any other law or regulation, including the Emergency Price Control Act.

The War Manpower Commission is instructing its regional and field organization to continue the work they have begun of scrutinizing each situation in which personnel has been or is being furnished by an engineering service company. In each case in which it is determined that the engineering service company is engaged in selling the services of skilled personnel to government contractors or producers, the WMC will:

1—Rule that the companies are engaged in a less essential activity and, as such, are not authorized to hire (a) any person who, within the preceding 60-day period, has been employed in an essential or locally-needed activity, except upon referral by the United States Employment Service, or, (b) any person who is hired for work in a critical occupation, irrespective of such person's prior employment history, only upon referral by or in accordance with arrangement with the USES.

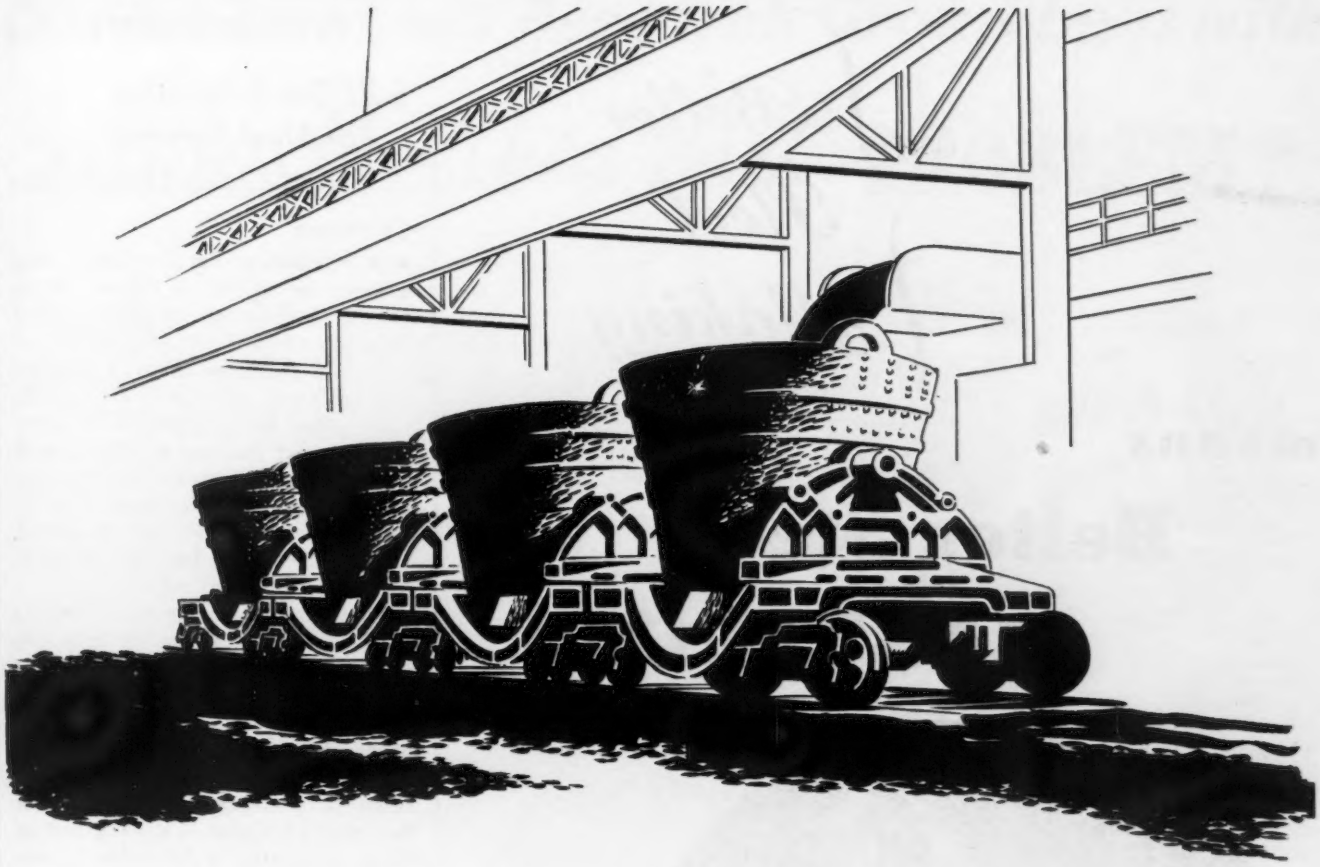
2—Instruct USES offices that they may refer workers to such companies only if no appropriate jobs in an essential or locally-needed activity are available.

3—Require the discharge by the engineering service company, and the termination of services by the producer or contractor, of each individual who the WMC determines was hired by the engineering service company in violation of WMC regulations. Any producer or contractor who fails to terminate the services of such individuals upon orders of WMC will be denied referral and recruitment services and privileges as long as such individuals remain in its service.

4—In any case in which workers are furnished by an engineering service company to a producer or contractor for whom a WMC manpower priority, employment allowance or employment ceiling has been established, workers so furnished who are doing the same work in the same plant and under the same conditions as employees of the producer and contractor, will be counted, together with such employees, for the purposes of administering such employment ceiling, employment allowance or manpower priority of the contractor or producer.

5—Review WMC procedures, programs and authority relating to the allocation of manpower to assure that the services of these workers will be available where most needed in war production.

The War Department, Navy Department, and the Maritime Commission stated that: "Appropriate steps will be taken to effect the discontinuance of existing contracts, and to avoid in the future the placement of contracts, with these 'engineering service companies' which are deemed improper or unreasonable."



At every step . . . Standard **CONTROLS** *its steel*

From acid open hearth to finished forging, the processes of steel making at Standard are under rigid control. Especially trained metallurgists and chemists carefully analyze the materials used in Standard products, safeguarding the high quality which is a "must" with every forging delivered to a Standard customer.

In forgings, castings, weldless rings, steel wheels and many other steel products the name Standard is an assurance of dependability and long service life. The Baldwin Locomotive Works, Standard Steel Works Division. Burnham, Pa., U. S. A. Offices: Philadelphia, New York, Chicago, Washington, Boston, Cleveland, St. Louis, San Francisco, Houston.

BALDWIN PRODUCTS

Hydraulic presses • Testing equipment • Steel forgings and castings • Diesel-electric locomotives • Diesel engines • Metal plate fabrication • Rolled steel rings • Bronze castings • Heavy machine work • Crane wheels • Bending rolls • Plate planers • Babbitt metal • Alloy iron castings • Briquetting presses.

ARMY NAVY

BLW THE BALDWIN GROUP

BALDWIN

STANDARD

STEEL FORGINGS & CASTINGS

Soft Ore Briquettes For Blast Furnace And Open Hearth Use

Cleveland

• • • **Patents have** recently been granted to H. R. B. Jones of the Geological Department of the Oliver Iron Mining Co., Duluth, for a process that produces hard cased briquettes from soft iron ore, concentrates, flue dust, or similar material. The original purpose of the research was to produce a substitute for open-hearth lump ore. The briquettes are suitable for this use, but in addition their use in blast furnaces seems to hold some potential value.

Mr. Jones states frankly that the cost feature of the use of briquettes in blast furnaces may not compare favorably with the increased production but because of the compactness of the briquettes it is believed that more concentrated burdening of the furnaces would pay dividends. The fact that no binder is used in making these briquettes is favorable in considering their use in the blast furnace.

Briefly, the processes involved in making the briquettes include the drying and screening of ores through a 100 mesh screen, forming at a pressure of about 20 tons, and then briefly heating the formed briquette to a temperature of about 2400 deg. F. This yields a product having a specific gravity of four plus with a hardened case about 3/32 in. deep that will withstand a drop of at least four feet to a solid surface without fracture. While increased density is obtained, the briquette still is porous.

The physical nature of the briquette recommends it for use in the open hearth as a substitute for lump ore. Again the cost factor may modify the product's use, but this factor has not yet been examined since no commercial continuous processing plant for the briquettes has been developed.

Again avoiding the cost factors but pointing to the possibilities of the briquettes for blast furnace charging there are a few possible advantages. Blast furnace charging of briquettes would duplicate a lump charging and prove beneficial to blast circulation through the charge by reducing the smothering effect that is noticeable with soft ores. Dust losses promise to be greatly reduced and a more concentrated charge could be possible due to the compactness and greater specific gravity of the bri-

Can Brake Shoe's "Research Group" help with

YOUR *Punished Part* PROBLEM?

BRAKE SHOE'S RESEARCH GROUP

1. *Engineering Laboratory*
2. *Metallurgical Laboratory*
3. *Experimental Foundry*

Every machine has at least one part that takes a special beating. Repeat sales often depend on the wear life of this "punished part."

One of the many activities of Brake Shoe's Research Group is to analyze all the kinds of wear that shorten the life of such parts—corrosion, heat, erosion, impact, abrasion — and to find practical ways to increase wear resistance.

The answer may lie in a new alloy. It may lie in different heat treatment. Or in an entirely different material. It may be a combination of factors.

Where success is achieved, it means for the customer a better product — and for Brake Shoe a new customer.

The resources of Brake Shoe's Research Group, recently enlarged by the addition of an Experimental Foundry, are available to manufacturers whose production calls for large runs of standardized parts.

Consider Brake Shoe As a Source for Postwar Parts in Volume

When it is time to solve your "punished part" problem, remember Brake Shoe may have a contribution to make. You are invited to write to R. B. Parker, American Brake Shoe Company, 230 Park Avenue, New York 17, New York.

AMERICAN **Brake Shoe** COMPANY

A parts source that may help you meet postwar competition

59 PLANTS SERVING INDUSTRY AND TRANSPORTATION

American Brakeblok Division	Detroit, Mich.
Ramapo Ajax Division	New York City
American Manganese Steel Division	Chicago Heights, Ill.
Brake Shoe and Castings Division	New York City
Kellogg Division	Rochester, N. Y.
American Forge Division	Chicago, Ill.
Southern Wheel Division	New York City
National Bearing Metals Corp.	St. Louis, Mo.
Electro-Alloys Company	Elyria, Ohio

quettes. It is expected that more units of iron could be charged and a greater quantity of iron could reach the hearth for the same reasons. Stack heat losses due to the drying of ore would likewise be eliminated as the drying is accomplshed during the processing of the briquettes. These later suppositions, of course, are based on the promise that the briquette processing would take place at or near the furnaces.

The briquettes are not considered competition for sinter in the blast furnace as the use of sinter is limited because of its porosity, the opposite of the smothering effect of soft, loose ores. Briquettes on the other hand provide a concentration of iron content in lump form that give high iron value to a burden and at the same time assure blast circulation. Used in combination with sinter, briquettes could add solids to the too porous sinter or in combination with loose soft ores assures blast circulation.

The briquettes for open hearth use also offer some advantages either for use in combination with sinter or instead of it. Sinter is considered too light for open hearth use unless weighted with scrap. Briquettes when used alone would eliminate the need for scrap as used with the sinter or might replace scrap as a weight for sinter charges.

Future possibilities for briquettes appear even better than present ones. It appears that even more extreme fines than 100 mesh will serve admirably in making briquettes. As the richer ores give out in the Great Lakes region and more concentration is required, extreme fines and tailings can be salvaged usefully in briquette form. While no one knows too definitely now how the Great Lakes' taconite deposits will be utilized it seems likely that the briquette could take its place as a useful vehicle for either the product of taconite concentration or its by-product.

Booklet Aids Inductees

• • • **Allis-Chalmers** Mfg. Co., Milwaukee, has published a special booklet for its employees now in the armed forces and for those about to be inducted, explaining beenfits provided for them and servicemen's rights under the soldiers' and sailors' civil relief act, with other information.

New Horizons in assembly line production have been brought into focus by the advent of CLUTCH HEAD Screws . . . opening the way to new degrees of speed, safety, simplicity, and economy.

What other screw invites operator confidence and speed with a recess bull's-eye target so wide and so easy to hit?

What other screw has a straight-walled recess engineered to reduce end pressure for a safe effortless drive home?

What other screw matches the CLUTCH HEAD Lock-On feature which unites screw and bit as a unit for free one-handed reaching to hard-to-get-at spots?

What other driver approaches the economy of the rugged CLUTCH HEAD Type "A" Bit for long continuous service and simplified 60-second "on-the-spot" reconditioning to original efficiency?

In field service too . . . What other recess has the logical design that makes it operative with the ordinary type screwdriver: even with a piece of flattened steel rod in emergency? And what other than the Type "A" Bit makes it possible to withdraw screws undamaged and saved by the Lock-On for re-use?

That you may personally examine and test these exclusive features, United invites you to send for package assortment of CLUTCH HEAD Screws and sample Type "A" Bit; also fully illustrated Brochure.

CLUTCH HEAD · SCREWS ·

UNITED SCREW AND BOLT CORPORATION

CHICAGO CLEVELAND NEW YORK

Bolt Firms Debate Use of New Steel

Washington

• • • **Bolt, nut,** and rivet makers reported to WPB that the industry is receiving adequate supplies of satisfactory carbon steel rod and wire. There has been some shortage of carbon steel to meet all stated requirements. Allocations were approximately 22 per cent less than the amounts requested, according to WPB. There is some tightness in the supply of rounds over ¾ in. in diameter. Structural defects in present day carbon steel have also been reported. The Steel Division reports that shortages of certain sizes of carbon steel wire in the Chicago area have been improved.

Steel Division officials reported that the problem of contamination of steel through use of scrap is becoming increasingly serious.

Operating heads of the mills say that, if operation is to be maintained at the present level, it will be necessary to increase output of triple alloy NE 8630 steel up to 60 per cent of total production. Steel Division officials told the group that nickel cannot be removed from the alloy, but that NE 8630 alloy is considered structually sound, and the Steel Division is ready to offer technical assistance to those manufacturers who have difficulty in using it.

Committee members said that the 4037 alloy steel now in common use is satisfactory, and that NE 8630 would be difficult to use, particularly in diaphragm head bolts, and Phillips recessed head screws.

Complete conversion to NE 8630 for the following reasons will cause a loss in productive capacity and make it very difficult to provide these items in required quantities:

1—Complete use of the triple alloy would cause a 30 per cent loss in productive capacity. The industry now uses a standard heat treatment for 4037 steel. Industry metallurgists were of the opinion, however, that it would be necessary to test each lot of NE 8630 steel and provide individual heat treatments.

2—Tool life would be greatly reduced by use of NE 8630. The material was found to head satisfactorily, but punch life was about 50 per cent lower than when used on A4037.

3—NE 8630 can be used satisfactorily for large bolts and other items without close tolerances, but A4037 should be maintained for types of bolts, nuts and screws previously mentioned. The industry would require only about 5000 tons quarterly for such parts.

Building Materials Division officials pointed out that much of the triple alloy is used in large nonprecision items. Its use is limited, however, by the fact that it cannot be used for rails, deep drawing stock or welding.

Introducing the KENNAMILL

The amazingly simplified inserted-blade step-cutter that makes high-speed carbide face-milling of steel possible in every shop!

Partially completed cut illustrating method of flycutting in steps—note bright, smooth finish obtained.

A sensational Kennametal achievement—the KENNAMILL—can give new life to your milling machines . . . adapting them for the high speed milling of steel that is inherent in modern, negative rake carbide cutters. At the same time, the Kennamill can improve the quality of your work by producing finished surfaces that are exceptionally smooth and accurate.

Kennamills are inserted-blade cutters, available in four sizes with taper shanks to fit standard spindles, as listed below. All sizes use the same ⅞" square, 10° negative back rake Kennametal-tipped blade (Cat. No. 39M40). Two sets of blades are supplied with each cutter head.

The low initial cost of Kennamills is combined with economy of blade maintenance. No expensive grinding equipment is needed—the blades are easily removed from the cutter head and resharpened to a template on a simple adjustable table carbide grinder. Accurate resetting in the head is not necessary since each blade cuts an independent path.

The use of Kennamills assures optimum machine performance. The sturdiness of the cutter body, plus distribution of the work over the keen-cutting Kennametal-tipped blades, minimizes vibration and chatter, smoothes out the load, and fully utilizes available horsepower, with feeds up to 21" per minute.

Kennamills are available for immediate delivery. They are stocked at our factory, and at Kennametal offices in Atlanta, Chicago, Detroit, Houston, Los Angeles, Philadelphia, New York, and San Francisco. Get in tune with the fast-moving tempo of carbide steel milling—order Kennamills today.

PRICES OF KENNAMILLS

(Complete, with 2 sets of No. 39M40 Kennametal-tipped blades)

Size	Fits Spindle	No. of Blades in Cutter	Price Each
2"-40	#40	3	$31.91
2"-50	#50	3	35.41
3"-40	#40	4	39.99
3"-50	#50	4	41.22
4"-50	#50	4	43.04
5"-50	#50	4	44.85

Extra Blades (No. 39M40) each $1.83

Templates—for regrinding blades—each $1.75

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, 144 LLOYD AVE., LATROBE, PA.

March Ore Usage Is Slightly Lower

Cleveland

• • • **Consumption of Lake** Superior iron ore for March and for the year to date has been somewhat below the amounts recorded for the same periods last year, according to the latest report of the Lake Superior Iron Ore Association. Consumption in the United States for March amounted to 7,426,429 tons, and in Canada 232,418 tons, totaling 7,658,847 tons. This shows an increase in consumption over the shorter preceding month when U. S. consumption was 6,997,404 tons. Canadian was 209,938 tons, and the total was 7,207,342 tons.

The year to date Lake Superior ore consumption figures show 21,715,440 tons for 1944 as compared with 21,984,342 tons for last year, by U. S. furnaces only. Canadian consumption for the year to date is 632,402 tons as compared with 608,207 tons last year. The total ore consumption to date in 1944 is 22,347,842 tons as compared with 22,592,549 tons last year.

Total stocks at U. S. and Canadian furnaces as of April 1 were 7,657,880 tons. This compares with 24,356,540 tons on March 1 and 21,149,825 tons on April 1. 1943.

Price Board Releases Renegotiation Regulations

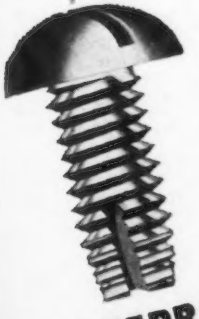
Washington

• • • **A portion of** the new Renegotiation Regulations to govern renegotiation of war contracts for fiscal years ended after June 30, 1943, comprising the introduction and, so far as completed, four of the eight chapters, has been released by the War Contracts Price Adjustment Board. The chapters released are as follows: Chapter I, dealing with authority and organization for renegotiation; Chapter II, dealing with procedure; Chapter VII, containing certain War Contracts Board forms; and Chapter VIII, comprising statutes, orders, joint regulations and directives. The other four chapters will be released as soon as available, probably within a few weeks.

Release was made to the Federal Register and the various law services. It is not contemplated that the regulations will be published by the Board in pamphlet form for general distribution inasmuch as they will be supplemented from time to time by amendments and additions which would automatically make any such pamphlet incomplete and out-of-date.

THE NEW MATERIALS DEMAND NEW FASTENING TECHNIQUES!

. . . . THROUGH EXACTING RESEARCH SHAKEPROOF ENGINEERS CAN COUNSEL YOU ON TYPES OF FASTENINGS AND METHODS OF ATTACHMENT FOR ANY APPLICATION!



SHAKEPROOF
TYPE 1
THREAD-CUTTING SCREWS
Actually cuts its own thread in metals of any thickness—eliminates taps and tapping operations. Snug, tight fit always certain. Special type for plastics.

Write today
FOR FREE TEST KIT No. 22

Your new product of improved light metal, plastic or processed wood demands correctly engineered fastening methods to assure speedy assembly, lower production costs and peak performance.

Shakeproof engineers, through laboratory research and vast field experience, thoroughly understand the assembly problems brought about by metallurgical and chemical advances in material processing. They can recommend the type and method of fastening that is best suited to your particular product . . . and to the requirements of your own assembly line.

Write today—a Shakeproof field engineer will be immediately assigned to discuss with you the particular fastening needs of your products.

ARMY (E) NAVY

SHAKEPROOF inc.
"Fastening Headquarters"

Distributor of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS
2501 North Keeler Avenue, Chicago 39, Illinois
Plants at Chicago and Elgin, Illinois • In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

Shakeproof Lock Washers with Exclusive Tapered-Twisted Teeth

Shakeproof Type 25 Thread-Cutting Screws for Plastics

Sems Fastener Units Pre-Assembled Shakeproof Lock Washer and Screw

Shakeproof Cowl Fasteners . . . "The Quick-Opening Lock"

Gear Cutters, Mills, And Planers Shown In Seized Patents

• • • This is the 25th list of seized enemy patents, available on license from the Alien Property Custodian. These patents are grouped in classes. Sub-class numbers are shown first in parentheses, followed by the patent number, description of the patent, the inventor's name and nationality, and the date of issuance.

This series began in the Nov. 4 issue of THE IRON AGE, page 95, at which time procedures for obtaining the patents for use were described with information concerning their usage and possibilities. Seized patent applications were shown in THE IRON AGE on July 8.

Class 90—Gear Cutters, Mills and Planers

(4) 1,639,624. Method of and machine and cutters for cutting concave and convex gears, and more particularly globoid gears, of a great variety of types, consisting of rotating the cutter bodily about an axis during operation which is at right angles to the axis of the gear blank. F. Woltzendorff, Germany. 8-16-27.

(4) 2,037,930. Machine for cutting bevel gears with longitudinally curved teeth. H. Schicht, Germany. 4-21-36.

(4) 2,119,295. Method of and machine for generating gears and more particularly gears having longitudinally curved teeth. H. Schicht, Germany. 5-31-38.

(4) 2,171,406. Process of generating bevel gears by a spiral rolling generating movement and apparatus for carrying out this process. H. Schicht, Germany. 8-29-39.

(4) 2,208,804. Gear cutting or other milling machine which has a frame having vertical slides on which the milling carriage or saddle moves. M. Pfauter, Germany. 7-23-40.

(5) 1,750,384. Method of and apparatus for cutting toothed gears. P. Bottcher, Jr., Germany. 3-11-30.

(6) 1,625,722. Bevel wheel shaping device operating according to the rolling system, in which the producing of the teeth is effected by the operation of the cutting tool upon the rotating work piece or blank. M. Harbeck, Germany. 4-19-27.

(6) 1,636,120. Shaping or planing machine for worm or screw shaped bevel wheel operating according to the development method. H. Brandenberger, Austria. 7-19-27.

(7) 1,961,396. Feeding and changing apparatus on gear cutting machines that operate by the rolling method. W. Schmitt and G. Rothe, Germany. 6-5-34.

(8) 1,957,028. Machine tooth for generating the teeth of bevel gears consisting in combination with a cutting tool, a chuck for the gear in which the teeth are to be generated and means for imparting to the tool and the gear relative rotation, relative displacement in parallel relation to an axial plane of the gear, and displacement transversely to the cutting direction, during the operation of the cutting tool. A. Maurer, Germany. 5-1-34.

(11) 1,692,380. Needle feeding mechanism designed to feed and present the needles one at a time to milling cutters. H. Nacken, Germany. 11-20-28.

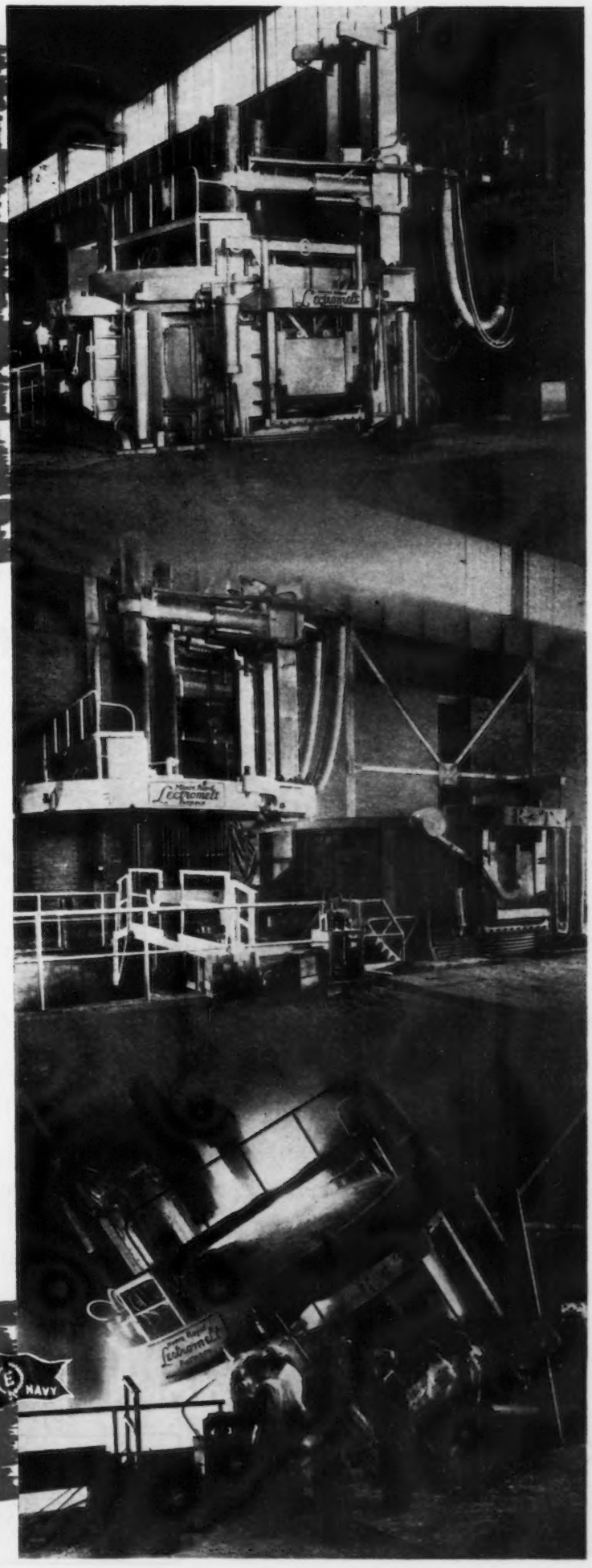
(13) 1,933,798. Manufacture of propellers consisting of an apparatus for milling propeller surfaces comprising a rotary support for a propeller, a milling cutter for the pressure side of the propeller having its milling circle set in the direction of the generatrix of the propeller surface and means for driving the milling cutter. F. Gebers, Austria. 11-7-33.

(13) 2,086,915. Machine tool for the generation of curved or straight faces or slots in work pieces or blanks which faces may be in a plane or may constitute curves in space, so as to obtain a much greater variety of forms in the generated faces or curves. F. Kopp, Germany. 7-13-37.

(13) 2,232,138. Profiling machine wherein structural sections and the like are attached to a template and shaped longitudinally, either straight or tapered, to conform to the profile of the template. J. Roloff and B. Zingsheim, Germany. 2-18-41.

(13.10) 1,617,312. Engraving machine for the production of various parts of different shape and sizes especially stamps and dies in

One of the Largest *Top Charge* Furnaces In the United States



THE illustrated "KT" Lectromelt is used for pouring 45 to 50 ton heats of alloy steel. The roof is hydraulically raised and rotated to one side for quick charging by drop bottom bucket. Both a main door and an auxiliary side working door are provided for convenience in working a heat. When the steel is ready to pour, the entire furnace is tilted hydraulically.

Lectromelt top charge furnaces are available in capacities from 100 tons down to 250 pounds. We will gladly forward more detailed information.

PITTSBURGH LECTROMELT FURNACE CORPORATION
Pittsburgh, Penna.

MOORE RAPID
Lectromelt
FURNACES

ARMY E NAVY

steel or any other hard material. L. Braren, Germany. 2-8-27.

(13.10) 1,972,910. Copying and engraving machine of the type employing a pantograph mechanism for holding and guiding the tool, the pantograph mechanism being movable about a vertical axis to shift the tool substantially horizontally and the mechanism as a whole being movable about a horizontal axis to shift the toll substantially vertically. K. Zwick, Germany. 9-11-34.

(13.10) 2,018,697. Engraving and copying machine of the type in which a pantograph system is used, a cutting tool and a tracing point or stylus being mounted on the pantograph system. K. Zwick, Germany. 10-29-35.

(13.10) 2,176,193. Engraving and copying machine in which the work may be reproduced either on the same scale or on an enlarged or reduced scale, and in which the pattern is similar to the work and oriented in the same direction as the work instead of being a reversed mirror image pattern. K. Zwick, Germany. 10-17-39.

(13.10) 2,178,131. Copying and engraving machine of the type capable of performing three dimensional work or relief work, sometimes called profiling machines. K. Zwick, Germany. 10-31-39.

(13.10) 2,204,841. Driving means for engraving and copying machines. K. Zwick, Germany. 6-18-40.

(13.10) 2,244,190. Profile copying machine comprising a frame having a main guide and work and copying tables, transverse slide on said main guide for a cutting tool and a guide pin, transmission means between said transverse slide comprising a shaft. H. Ehrenberg, Germany. 6-3-41.

(13.10) 2,247,462. Milling and copying machine including means for holding work and a pattern, a tracing stylus for cooperation with the pattern, a frame, a cutter spindle for holding a cutting tool for normal cutting operations on the work. K. Zwick, Germany. 7-1-41.

(13.1) 2,260,157. Counterbalancing means for engraving and copying machines. K. Zwick, Germany. 10-21-41.

(13.2) 1,837,336. Duplicating apparatus for permitting bookkeeping entries or the like to be copied from an original sheet, which is provided with reversed script capable of transfer by impressions on to account cards, sheets, bags, etc., which at the point where printing is to be performed, are previously moistened with a thin film of a readily volatile liquid serving to dissolve the copying ink of the original. W. Ritzerfeld, Germany. 12-22-31.

(13.30) 1,755,967. Copying machine whereby sculptured articles or articles in high and bas relief may be copied or reproduced. A. Pagani, Italy. 4-22-30.

(13.40) 1,608,448. Appliance for grinding, milling, boring machines and the like constructed in such a way that the shaft, which carries the work piece, is made to reciprocate relatively to the cutting tool by means of a connecting rod and a crank mechanism which may be driven by means of a worm gear from any available source of mechanical power. C. Weber, Germany. 11-23-26.

(13.40) 2,092,142. Automatic machine tool control. H. Schuz, Germany. 9-7-37.

(13.50) 2,067,962. Engraving and copying machine of the class in which pantograph mechanism is employed. K. Zwick, Germany. 1-19-37.

(13.90) 1,933,362. Automatic twist drill milling machine in which the blank is fed from the magazine to the working spindle and holding device, slowly moved towards the cutters, rapidly turned after milling and guided back slowly to the cutters for another fluting operation. J. Bergstrom, Germany. 10-31-33.

(13.90) 2,116,181. Manufacture of hydraulic couplings of the Fottinger type. G. Bauer, Germany. 5-3-38.

(14) 1,670,413. Milling machine having crank drive and automatic feed. H. Kneidl, Germany. 5-22-28.

(15) 1,689,370. Machine for generating and marking cams which is equally suitable for generating or marking cams of the disk as well as of the end type, such cams being used for instance in connection with automatic or semi-automatic machine tools. K. Tessky, Germany. 10-30-28.

(15) 2,149,791. Machine tool for the performing of "four corner work," namely, the machining, for instance, of a four cornered flange of a casting of rectangular cross-sectional shape in a close cycle of operation, or of other pieces of work presenting four cornered portions. M. Saupe, Germany. 3-7-39.

(16) 1,992,403. Milling machine structure

IMPROVED PULL-UP BROACHING MACHINES

by

Colonial

8 Models in 6 to 25 tons rating and 36 to 60 inch strokes.

40% overload capacity . . . . Lower operating oil pressure for a given tonnage rating . . . . Minimum floor space—vertical motor mounting within column . . . . Automatic Broach handling . . . . Adjustable broach handling bracket to handle different broach lengths . . . . Puller brackets designed to handle 2 or more broaches . . . . Maximum platen rigidity with well-ribbed broach thrust bracket . . . . Platen removable for re-tooling . . . . Dual safety interlock mechanism . . . . Streamlined for appearance and strength . . . . Automatic lubrication of slide with its hardened and ground gibs . . . . Cylinders integral with both main and broach slides . . . . Plain or latch-type face plates . . . . Swinging locating fixtures with broach interlock available.

colonial BROACH COMPANY
DETROIT 13, U.S.A.
Broaches Broaching Machines Broaching Equipment

of the type in which the milling spindle can be moved also in its longitudinal direction to a certain extent in a slide which is guided in a vertical direction between two standard members. R. Stuhlmacher, Germany. 2-26-35.

(16) 2,231,589. Driving mechanism for milling, boring, and like machines. C. Olivetti, Italy. 2-11-41.

(17) 1,983,090. Machine for universally milling, grinding, and drilling work-pieces of all kinds. R. Kolsch, Germany. 12-4-34.

(17) 2,008,083. Machine for measuring and machining frames and underframes of vehicles, especially railway bodies. L. Muller, Germany. 7-16-35.

(18) 2,007,314. Knee and column milling and like machine. R. Stuhlmacher, Germany. 7-9-35.

(20.50) 1,908,478. Machine tool of the type in which a movable U-shaped tool girder is provided on the bed of the machine. F. Eisele, Germany. 5-9-33.

(20.5) 2,030,481. Machine tool particularly milling machine having a counter support. R. Stuhlmacher, Germany. 2-11-36.

(20.50) 2,138,987. Machine tool, particularly a milling machine, provided with an overarm supportedly relative to the machine standard for the purpose of attaining great rigidity of the overarm. R. Stuhlmacher, Germany. 12-6-38.

(21) 1,872,992. Method and machine for cutting slits in type bars. H. Luce, Germany. 8-23-32.

(21) 1,920,042. Hydraulic drive for the adjustable parts of machine tools and the like. F. Walther, Germany.

(21) 2,078,871. Machine tool or the like in which a device for changing the speed of the work table and a device for reversing the direction of motion of the table are both controlled by a single common control lever. O. Panzner, Germany. 4-27-37.

(21) 2,121,923. Milling machine of the type having a table, which carries the piece of work under treatment and is slidably mounted in a supporting frame, bed or knee, and a mechanism for longitudinally moving said table to and fro relatively to a milling cutter, or other cutting tool. H. Neubert, Germany. 6-28-38.

(22) 1,985,861. Device for obviating backlash in thread spindle gearings serving for moving a machine part or the like, comprising, in combination, two gearings, each thereof comprising, in turn, a threaded spindle and a nut thereon, one of these two members of one of said gearings being driven and one of these two members being freely axially shiftable with respect to the other member. V. Jereczek, Germany. 12-25-34.

(22) 2,206,479. Device for equidirectional milling on metal milling machines. V. Jereczek, Germany. 7-2-40.

(22) 2,208,986. Driving device for milling machines in which the milling procedure can be carried out equidirectional with the feed of the work-piece, as well as in opposite direction thereto, there being employed in milling machines of this type two threaded spindles, each of which cooperates with a correspondingly threaded nut. V. Jereczek, Germany. 7-23-40.

(22) 2,224,257. Mechanism for eliminating backlash in machine parts driven by means of a screw and nut. F. Eisele, Germany. 12-10-40.

(24) 1,759,327. Apparatus for machining welded rail joints for the purpose of reducing and removing the projecting portion of the welding collar on the tread surface of the rails. H. Schultz, Germany. 5-20-30.

(24) 1,861,670. Device for the working of metal bands, especially lines, for typographic purposes. J. Wagner and W. Krostewitz, Germany. 6-7-32.

(24) 2,236,829. Method of operating on the slant surface of nonprismatic workpieces, more particularly pyramidal or truncated pyramidal or conical or truncated conical blocks. J. Musil and H. Ast, Austria. 4-1-41.

(33) 2,259,969. Device for guiding and holding the broaching tool on broaching machines. K. Bake, Germany. 10-21-41.

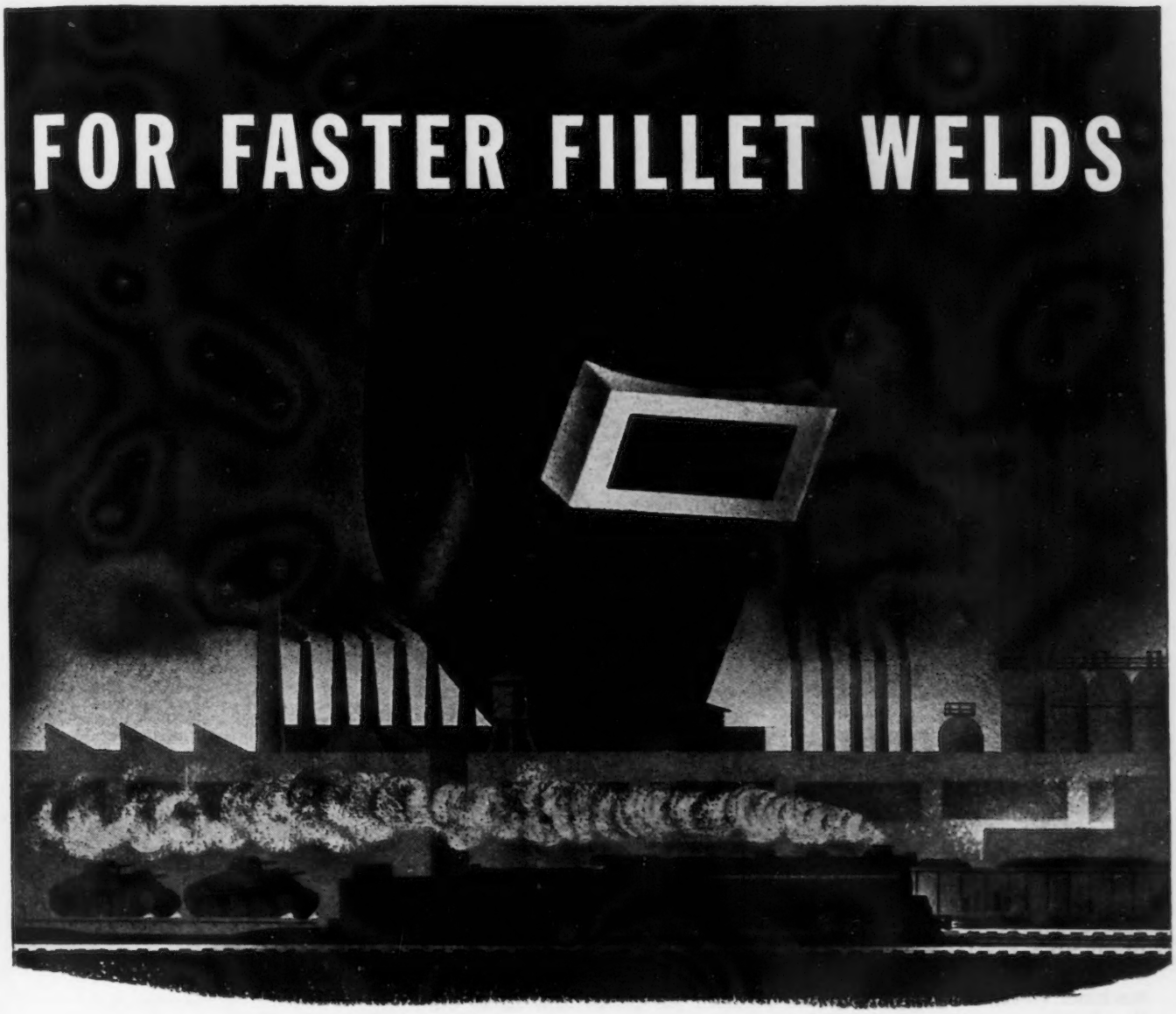
(38) 1,925,215. High speed shaping machine with hydraulic drive. E. Sturm, Germany. 9-5-33.

(38) 2,058,782. High speed planing machine with hydraulic ram drive. H. Feilkas, Germany. 10-27-36.

(38) 2,149,919. Rapid shaping machine for work on metals with the ram thereof movable only forwards and backwards. E. Krenzler, Germany. 3-7-39.

(38) 2,297,268. Shaping machine wherein

FOR FASTER FILLET WELDS



Use Raco 20 Shielded-Arc Electrodes

High-quality deep penetration single-pass fillet welds, and more of them per hour, are assured when you use Raco 20 Shielded-Arc Electrodes. And with these electrodes you can obtain the same top-grade production whether you employ direct current straight polarity or reverse, or alternating current.

The advantages of Raco 20 Shielded Electrodes are of greater importance now than ever before. We shall be glad to send you samples so you may test their outstanding performance. Just write

Raco 20 Conforms with the following specifications: A.W.S.—A.S.T.M. Specification A233-42T, Type E-6020. U. S. Bureau of Ships Specification 46E3 (INT) Grade II Class 2.

The **REID-AVERY COMPANY**

DUNDALK BALTIMORE 22 MARYLAND

NEWS OF INDUSTRY

the tool holder slide is reciprocable transversely to the planing direction. F. Wegerdt, Germany. 8-29-42.

(56) **1,648,034.** Index plates having means for adjusting and locking the indexing members thereof. F. Ungerer, Germany. 11-8-27.

(58) **1,697,372.** Milling machine for drills such as are used by dentists and for similar tools. G. Schweizke, Germany. 1-1-29.

(58) **2,098,132.** Mechanism for producing accurately pitched cutting on circular work. E. Buchholz, Germany. 11-2-37.

(58) **2,145,355.** Milling machine suited especially for equidirectional milling. V. Jereczek, Germany. 1-31-39.

(58) **2,155,680.** Rotary table for machine tools. M. Pfauter, Germany. 4-25-39.

(58) **2,235,444.** Milling machine of the type having a horizontal arbor for the milling cutter and a vertically adjustable worktable. R. Wohlfarth and P. Mitter, Germany. 3-18-41.

(59) **1,757,726.** Swiveling arbor support which is so connected with the supporting column that it may be swung vertically to a position in alinement with the supporting column. P. Liebscher, Germany. 5-6-30.

(59) **1,885,628.** Arbor support for gear cutting machines. R. Reinecker, Germany. 11-1-32.

(59) **1,954,759.** Chuck for clamping special work pieces comprising in combination a rotary supporting body having two working sides which are each bounded along their longitudinal edges by detachable hooked retaining jaws. W. Spetz, Germany. 4-10-34.

(60) **2,247,656.** Vise in which the jaws are movable on the jaw carriers, at right angles to the vise bed and parallel to each other. B. Friedrich, Germany. 7-1-41.

(62) **1,705,957.** Engraving machine having a bearing for the cutter spindle capable of rotating at high speeds and mechanism for raising and lowering this bearing whereby a fast and slow axial movement is controlled by a single member and adjustable means for limiting the depth to which the engraving cutter may enter the material. L. Konrad, Germany. 3-19-29.

(62) **2,024,196.** Cutter bearing for the cutting spindles or arbors of engraving and copying machines and the like. K. Zwick, Germany. 12-17-35.

(62) **2,046,013.** Tracer control for material working machines. R. Bingel and H. Weinert, Germany. 6-30-36.

(2) **1,925,025.** Process and apparatus for accurately cutting and rectifying gears. P. Amann, France. 8-29-33.

(3) **1,660,888.** Milling machine for cutting spur gears. H. Romanoff, France. 2-28-28.

(4) **2,102,540.** Machine for hobbing the teeth of worm wheels. G. Lechesne, France. 12-14-37.

(9) **2,024,747.** Manufacture of spur and bevel wheels. F. Samek, Poland. 12-17-35.

(11) **2,110,530.** Process for the mechanical trimming of pieces of any kind by the reproducing machine. L. Saives, France. 3-8-38.

(13) **1,874,810.** Electrically controlled milling machine for metal. L. Saives, France. 8-30-32.

(13.3) **1,776,041.** Machine for the reproduction of sculpture. E. Quattrocchi, France. 9-16-30.

(13.3) **1,795,887.** Machine for the reproduction of sculpture. E. Quattrocchi, France. 3-10-31.

(13.3) **2,204,696.** Machine for manufacturing propeller blades by copying. P. Ratie, France. 6-18-40.

(13.4) **1,903,027.** Apparatus for cutting out tracks of a sine shape on a guide cylinder intended to guide rollers connected to a reciprocating piston so that when the rollers follow the sine track the reciprocation of the piston is transformed into rotation of a shaft. H. Capdet, France. 3-28-33.

(13.6) **2,102,505.** Machine for the tooling of metallic screw propeller blades. C. Berthiez, France. 12-14-37.

(20) **2,048,947.** Machine for cutting transverse grooves in pneumatic and resilient tires. E. Piquerez, France. 7-28-36.

(24.3) **1,847,005.** Machine for smoothing and re-smoothing ingot molds and other hollow articles. R. Henry, Luxemburg. 2-23-32.

(29) **1,739,465.** Machine for automatic cutting of recesses or the like in straight or curved direction on surfaces. A. Jorgensen, Denmark. 12-10-29.

Prelude TO A PERFECT FINISH

CHICAGO MOUNTED WHEELS AND SMALL GRINDING WHEELS

A complete range of styles, grains and sizes up to 3" in diameter to give you a perfect finish on every job.

PROMPT DELIVERY

Specialization—with full W P B approval—on sizes 3" in diameter and under, means no waiting for Chicago Grinding or Mounted Wheels. Let us take care of your present and post-war requirements.

FREE ENGINEERING ANALYSIS

If you have a grinding job that presents a problem because of the nature of material, tricky shape or other reason, tell us about it. Our experts will go into a huddle and give you the benefit of our long experience making millions of custom built wheels for every conceivable operation.

YES, YOU CAN FINISH IT BETTER WITH A CHICAGO WHEEL

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Abrasive Industry.

Just as the prelude to a new world is better tools of war, so the prelude to a perfect finish is better grinding wheels.

Today's standards of finishes are far and beyond those of yesterday. To acquire them without sacrifice of production time is a goal which everyone seeks.

Finish must now be measured in micro inches. That's where the new Chicago FV BOND Wheels excel. They give a precision smoothness so intensified that it passes any surface analyzer test, in many cases eliminating hand lapping and auxiliary finishing operations.

HERE'S WHAT MAKES CHICAGO WHEELS CLICK—

A—Sensational new FV BOND. Result of research and experiment on hundreds of aircraft jobs.

B—No sacrifice of cutting time or wheel life.

FV BOND is available in all types of Chicago Mounted and Small Grinding Wheels—in all abrasives, grain and grade combinations.

TEST WHEEL FREE—To prove their superiority in your own shop, send for a Chicago Wheel made with FV BOND. Give us details of the job, material you want to finish and we'll do the rest.

Write for Catalog and interesting Engineering Survey Form

CHICAGO WHEEL & MFG. CO.

1101 West Monroe Street Dept. RA Chicago 7, Ill.

NAVY E

MOUNTED WHEELS

SMALL GRINDING WHEELS

Send Catalog and Survey Form. Interested in
☐ Grinding Wheels
☐ Mounted Wheels
☐ Send Test Wheel
Size _____

NAME _____

ADDRESS _____

Boston Area War Contracts Increase

• • • Available statistics show new prime contract placements in the Boston War Manpower Commission area from Oct. 1, 1943, to Feb. 29, 1944 (January and February returns partly tabulated) increased from an average of $28,500,000 per month to $47,500,000. The $47,500,000 average represents major war contracts for more than $50,000 awarded to plants in 42 communities, but does not include subcontracts nor offsets for cutbacks and cancellations.

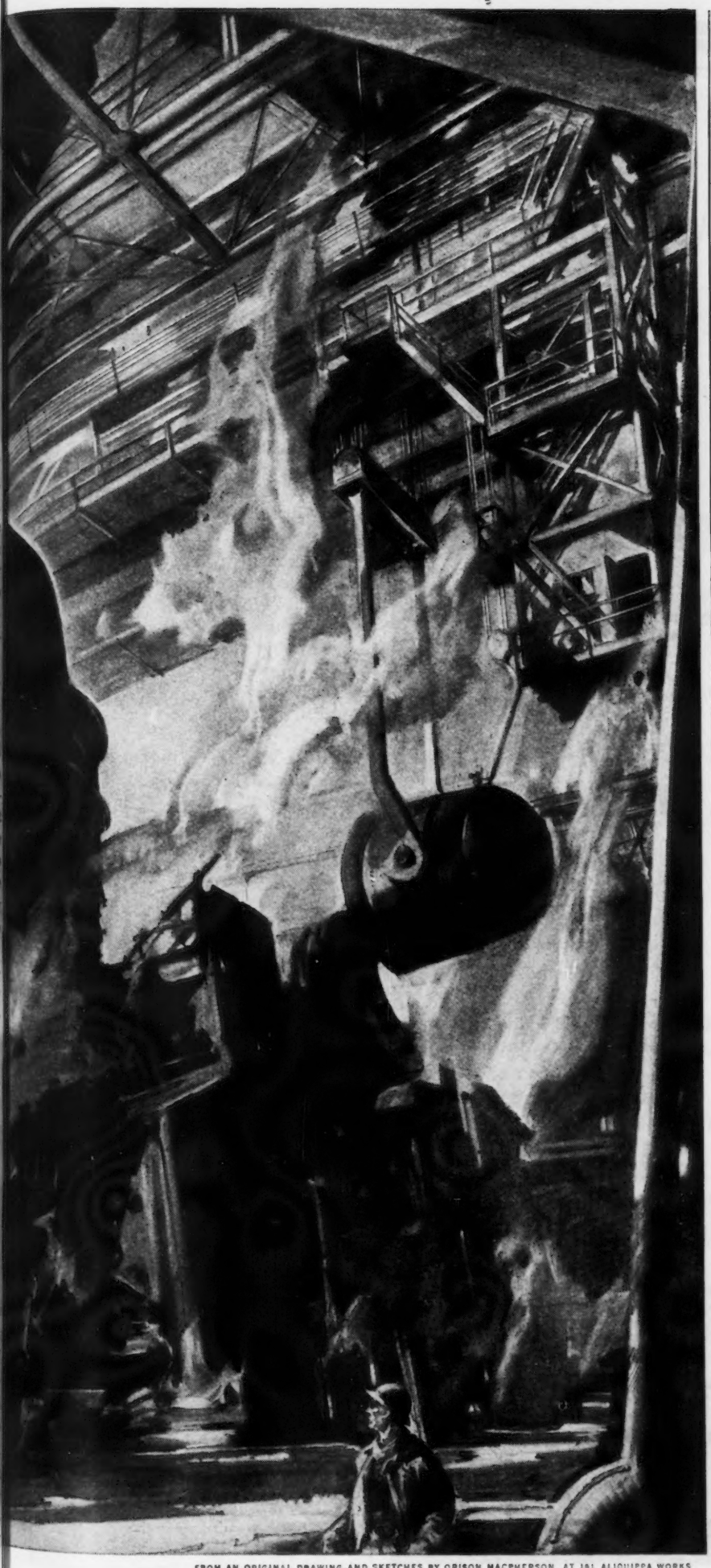
These figures indicate Boston's war production has not suffered by its Group II manpower classification, and are noteworthy in view of the tight labor situation, There is an urgent need for all classes of labor from the most skilled machinist to common laborer, not only in the Boston area but in all the western Massachusetts manufacturing areas.

Releases of draft age and older workers at shipyards have not been reflected in other industries. Progress in increasing female labor personnel has been more successful (from a gross standpoint) in electrical equipment and plants engaged in light work than in heavy industries, but the turnover in light industries remains high and personnel therefore is more or less uncertain. Material handling methods have, from necessity, had to be revamped in heavier industries.

There have been instances during April where Massachusetts metal working plants have discharged labor because of a lack of business. Such discharges, with very few exceptions, have been in areas where no labor shortages exist. Discharged workers generally do not migrate to other areas where help is needed.

Twin-Fast Advertising Wins "Award of Merit"

• • • The advertising campaign in this and other trade publications on the Twin-Fast Screw has earned an Award of Merit as one of the six best industrial advertising campaigns of 1943. The award was made by Associated Business Papers in their second annual competition. Both the Blake & Johnson Co., Waterville, Conn., manufacturers of the Twin-Fast Screw, and Ben Sackheim, Inc., New York, the agency that created the series, were awarded Certificates of Merit.



FROM AN ORIGINAL DRAWING AND SKETCHES BY ORISON MACPHERSON, AT J&L ALIQUIPPA WORKS

THE BESSEMERS

"Blow air through molten iron and expect to improve its quality? or make steel? Ridiculous idea!" exclaimed British iron workers back in the 50's when an Englishman first proposed it. "A crazy notion! It will just cool the iron!" scoffed iron workers in this country when an American began toying with the same idea at about the same time. But the inventors persisted with their experiments in oxidation of molten metal and secured such results that the world experienced an industrial evolution which gave it the superior metal, steel, in commercial quantities, at prices that enabled its wide application in commerce, construction and transportation. (In the 50's steel was made in small lots, sold for $250 to $300 a ton).

42-year-old Henry Bessemer, prolific British inventor, not then a steel man, conceived the converter for transforming iron into steel by blowing air through the molten metal, and patented it in 1855. (He formed own steel company in 1858). Bessemer was knighted at 66, not for inventing steel converter, but for suggestion he made when only 20 years old for an improvement preventing re-use and counterfeiting of seals and stamps on official documents.

"Kelly's air boiling process" was the name William Kelly, an ironmaster of Eddyville, Ky. and a native of Pittsburgh, gave to his experiments in a crude little brick furnace pot in which, a few years before Bessemer's invention, he explored his "crazy notion." Kelly's converter, by his own admission, never "converted," i.e. changed iron into steel, but did yield a more highly refined iron.

Bessemers are spectacular, especially at night, as their pulsating flames and sparks fan high in the heavens, constantly changing colors from ruddy red through burnt orange and pale yellow to blinding white. Converters situated on banks of rivers or lakes put on a show that is doubly thrilling by reflection of the fiery scene upon the black night waters. Travelers to Pittsburgh often watch the stirring technicolor picture of the Bessemers at work for Victory in the big J&L Pittsburgh Works along the Monongahela River, and gaze fascinated at the fiery scene when passing the great 4-mile long J&L Aliquippa Works on the Ohio River.

25 tons of steel every 15 minutes are made in the big pear-shaped Bessemer vessels. Demands for war steel keep the Bessemers of America working night and day, seven days a week, month in, month out.

The unwinking eye of the Bessemer flame control device, an invention of Jones & Laughlin (patented in 1940), is the first basic improvement made in the process since Sir Henry's day. It is an arrangement of photo-electric cells, filters and relays which indicates the precise moment the analysis of the steel is right.

Materials Handling System for Brazil's Ore Mine Unique

• • • **Probably the richest** iron ore discovery to date is that at Caue peak, in Minas Geraes, Brazil. Some of the ore assays as high as 65 per cent iron, with weights running as high as 200 lb. per cu. ft., as compared with the more usual 90 to 110 lb. per cu. ft. The deposit is so rich that even the surface scrapings are valuable, and such material that must be removed to form a bed for the conveyor belt system is being saved to be the first loads carried on those belts. Actual operations are not expected to begin in less than a year, and installations have not yet been started.

Parsons, Klapp, Brickenhoff & Douglas, an American engineering firm, has been retained to engineer the complete project of mining and processing the ore. The deposit contains upward of 15,000,000,000 tons of ore, and beginning in 1944 and continuing for three years, annual production of about 1,500,000 tons will be divided between the United States and Great Britain.

Motor installations will be made by the International General Electric Co., as announced in THE IRON AGE, March 2, 1944, p. 96. Robins Conveyors, Inc., Passaic, N. J., has been selected by the engineers in charge to handle the designing and manufacture of the entire materials handling phase from primary crushing through secondary crushing, stocking, reclaiming, and delivery to railroad cars.

The ore will be trucked from the top of the mountain where it is mined to the crushers where it will be sized and passed to a cantilevered stocking conveyor. A Robins Ore Feeder will deliver ore at a controlled

COMING EVENTS

May 8—Association of Iron & Steel Engineers, spring conference, rolling mill committee, Pittsburgh.

May 9, 10—American Steel Warehouse Association, Inc., Chicago.

May 25—American Iron and Steel Institute, New York.

June 19-22—American Society of Mechanical Engineers, Pittsburgh.

June 5-7—SAE National War Materiel Meeting, Detroit.

New

50,000 KVA INTERRUPTING CAPACITY

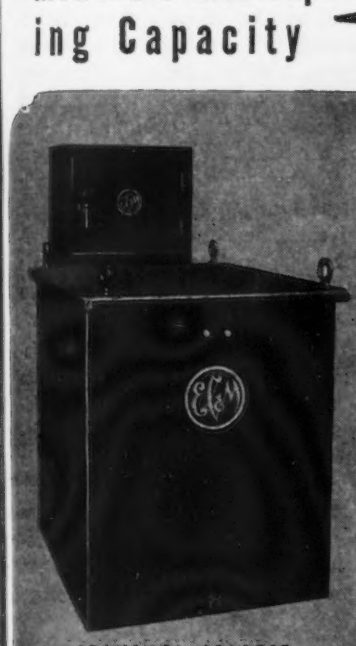
MOTOR STARTERS BY EC&M

Also Available in 25,000 KVA and Moderate Interrupting Capacity

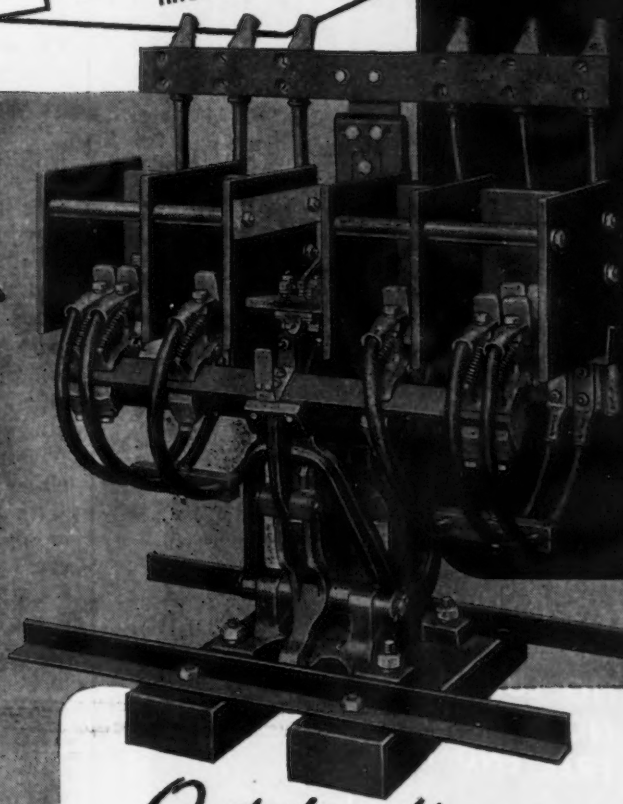
HEAVY DUTY MAGNETIC CONTACTOR - - 1500 H.P. Max. 2300 Volt Contactor - - 50,000 KVA Interrupting Capacity

THESE heavy-duty starters, for full voltage starting of **2300 volt** and **4600 volt motors,** are of magnetic contactor design—suitable for both severe, repetitive starting and inching applications.

Where equipment with high interrupting capacity is required, 25,000 and 50,000 KVA starters are recommended. Also available are moderate interrupting capacity starters for 2300 volts. Reversing starters have two moderate capacity contactors, mechanically and electrically interlocked and mounted in one tank.



STANDARD STARTER
with oil-immersed contactor tank in front and overload relays accessible through door above.



COMBINATION STARTER
having self-contained disconnect switches—contactor-tank at rear.

Outstanding FEATURES OF DESIGN!

1. Heavy-duty, magnetic contactors specifically designed for high voltage service.
2. Contacts are large and provide over 2" opening at the off position.
3. Self-contained potential transformer supplies 220 volts for push-button operation.
4. Adjustable type overload relays, magnetically reset from push-button—or hand-set if desired.
5. Convenient terminals and large conduit connection box make installation easier, faster.

Send for new Bulletin 1062-C for *full voltage starting* of 2300 and 4600 volt motors. It also describes Type VIII Enclosed Starters for Class 1, Group D Hazardous Locations.

★ ★ ★ ★ ★ ★

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79th STREET CLEVELAND 4, OHIO

tonnage per hour. As the density of the ore varies, ranging mainly from 150 lb. per cu. ft. downward, a feeder that would deliver this ore at a uniform, controlled rate, regardless of density of passed material, was required.

A Weightometer, connected electrically with the feeder, will maintain constant check on the tons per hour being conveyed. If density goes up, the feeder automatically will slow down. Thus, the feeder functions in direct relationship with the density of the particular ore conveyed.

From the mountainside storage pile, ore will be brought down hill to the secondary crushing station by six conveyors 1000 ft. long. These conveyors will also generate electric current used to run machinery in the rest of the plant. When the ore enters the secondary crushing station, it is sized and crushed again if necessary. It will then be separated and segregated by size and content, with overs and middlings passing through one process and fines through another.

The overs feed to a reversible distributing conveyor that can be run to either of two tripper conveyors. Middlings feed to a second reversible distributing conveyor that can be run to either of these two tripper conveyors. With this arrangement, a flexible storage system will be provided, because any size or mixture of sizes can be stored in either of two storage areas.

Tripper conveyors will deliver material to a traveling stocking tower equipped with a 100 ft. boom conveyor from which the ore falls into outside storage piles. The normal segregation will be into four piles, as follows: 3 to 8-in. regular ore; 3 to 8-in. high phosphate ore; 0.5 to 3-in. regular ore; and 0.5 to 3-in. high phosphate ore.

For reclaiming sized material, tunnel conveyors will be installed, meeting at a carloading conveyor. This carloading conveyor will be a vertical curve to deposit material into the track bin. It will have four openings, two for each track, equipped with roller gates powered by cylinders of compressed air actuating plungers.

Besides making the plant a self-generating power plant to provide its own electric current from the action of the belt conveyors, the materials handling portion of the project is designed with every conceivable safety precaution, including the duplication of practically all equipment.

Among the Week's Trade Notes

Rustless Iron & Steel Corp., Baltimore, has moved its Chicago office to 310 Michigan Bldg., Room 1010. R. L. Springer, manager, is in charge.

•

Yale & Towne Mfg. Co. has purchased the scale business of the Kron Co. of Bridgeport, Conn.

•

Hole Engineering Service, Detroit, has moved to 13722 Linwood Ave.

•

Salkover Metal Processing Co. of Chicago and Long Island City has moved its Chicago plant from 3249 West Ohio St. to 4209 West Lake St.

•

Climax Molybdenum Co., New York, has opened offices at 624 Fisher Bldg., Detroit. V. A. Crosby will be in charge of the office.

•

Link-Belt Co., Pacific division, has opened a sales office and warehouse at South 151 Lincoln St., Spokane 8, Wash. Homer A. Garland will be in charge.

•

Kelley-Koett Mfg. Co., Covington, Ky., has opened a new sales office at 108 Garfield Place, Cincinnati.

•

H. G. Mueller and Associates announced the opening of offices in Erie, Pa.

•

Fairbanks, Morse & Co., Chicago, opened a new office in Tulsa, Oklahoma, under the management of F. D. Ratcliffe.

•

Continental Can Co. of Canada, Ltd., Montreal, has completed arrangements for a large expansion program with the purchase of the Macdonald Mfg. Co. plant in Toronto and has also added to its plant at St. Laurent near Montreal.

•

William H. Keller, Inc., has changed its name to Keller Tool Co. This change does not involve any change in management or in the business of the company.

•

Barium Stainless Steel Corp., Canton, Ohio, has changed its name to Barium Steel Corp.

•

Doyle Machine & Tool Corp., Syracuse, N. Y., has changed its name to Doyle Mfg. Corp.

•

Rome Mfg. Co. Division of Revere Copper & Brass, Inc., announces the opening of a sales office in the New York Central Building, New York. Donald G. Noakes is district manager.

•

Whitman & Barnes, Detroit, division of United Drill and Tool Corp., has recently opened a new branch at 2305 East Eighth Street, Los Angeles. A complete line of twist drills, reamers and other tools made by the company will be kept in stock.

•

Pollak Mfg. Co., Arlington, N. J., has taken over the manufacturing operations that have been carried on by its wholly owned subsidiary, Pollak, Inc. Current trading assets and liability for materials subsequently received and to be received on purchase orders of Pollak, Inc., have also been assumed.

•

American-Marietta Co., Chicago, has purchased the Sewall Paint & Varnish Co. with plants in Kansas City and Dallas.

•

Continental Roll & Steel Foundry Co., East Chicago, Ind., has changed its name to Continental Foundry & Machine Co. This change does not affect the corporate structure, management or personnel of the company.

•

Manco Mfg. Co., Bradley, Ill., has purchased the Carolus Line of bolt and wire cutters, end cutters and nut splitters.

•

W. H. Maze Co., Peru, Ill., has announced the purchase of the Filshie Lead Nail Co., Chicago.

Beehive Coke's Role In War Described

• • • How the beehive coke industry has progressed during the war was outlined recently by Joseph Kelley of the Bureau of Mines before the AIME at Pittsburgh.

The beehive coke industry sent more than 7,000,000 tons of coke to the nation's blast furnaces in 1943, or 12 per cent of all coke used in the production of blast furnace iron, a raw product of steel, Mr. Kelley said in a report prepared for the Blast Furnace and Raw Materials Committee of AIME.

"Without this supply of beehive coke, blast-furnace demands of our national steel-expansion program could not possibly have been met in such a satisfactory manner," Mr. Kelley asserted. Today, 88 per cent of all the beehive coke produced in the United States goes directly to blast furnaces.

Back in 1916, beehive coke production reached 35,000,000 tons—the greatest year in history. There were 65,065 ovens in operation. In 1932, or just 16 years later, beehive production virtually had ceased. Most of the beehive plants were deliberately destroyed because the industry was considered dead and because of taxation problems in certain counties.

When the reconstruction of the industry began, the beehive field presented "a sorry picture of abandoned plants," according to the Bureau engineer. The machinery for drawing coke, for charging the ovens, and even the railroad sidings, had been scrapped in many instances. Oven walls and fronts had been destroyed. As the wartime demands for coke increased, some of the less favorable plants were rehabilitated at great cost and others used improvised methods to step up production. Truck transportation schedules were arranged, coke drawing machines were constructed from bulldozers and used truck parts, and at one plant a mule was used to move the larry car along the oven top.

In spite of the remarkable production record of the industry, it still is beset by difficulties. Some of the coals available to plants are of inferior quality, and the industry has lost many of its best and experienced workers. In addition, some ovens are in poor condition because the operators cannot afford to risk spending more money to place the ovens in the proper condition.

OPA Sets New Price Formula for Machinery

Washington

• • • **Manufacturers' maximum** prices for modified machines and parts for which there was an established price on the base date are to be determined by adding to, or subtracting from, the maximum price of the original machine or part the increase or decrease in factory costs resulting from any change in the machine or part since the base date.

This OPA action, effective April 18, 1944, establishes a simple method for determining the maximum prices of modified machines and parts which will be in line with those in effect on the base date. It replaces the former method of completely recalculating maximum prices whenever a machine or part was in any way changed.

This new method of calculating maximum prices applies to all manufacturers producing machines the cost of which has been altered by the shift from natural rubber to synthetic rubber tires, with the exception of farm equipment manufacturers. These manufacturers are under a different price regulation, which already permits them to pass along increased costs due to the use of synthetic rubber tires.

Weldability of Steels Subject of AWS Booklet

New York

• • • **Determination of the** effect of welding procedure upon the ductility of the heat affected zone adjacent to an arc weld in plain carbon or low alloy steel is proposed in a booklet just published by the American Welding Society, entitled "Guide to Weldability of Steels." It is the work of the War Metallurgy Committee and the Welding Research Council. The booklet (90 pp.) points out that loss of ductility next to the weld is the result of hardening due to too great a rate of cooling in the welding operation. Rate of cooling is determined by the rate of heat input (current, voltage and speed of arc travel) and the rate of heat extraction by the base metal. The hardening response of any given type of steel is measured by the Jominey end quench test and the corresponding ductility is determined by notch bend tests on specimens of the same hardness. Tabular data relate welding conditions with Jominey hardness factors. The booklet is available at $1 per copy from the society at 29 West 39th Street, New York 18.

Abandon Old Machines, Adjust Pay, Labor Advises

• • • **A series of** recommendations designed to help increase the wartime output of anti-friction bearings has been submitted to WPB by the Anti-Friction Bearing Labor Advisory Committee. The committee, which represents seven key unions in the industry, declared: "We believe that the establishment of harmonious labor relations in this industry will be the most important single contributing factor toward increased production."

The report said that great improvement could be achieved in the efficiency of the industry by "the quick replacement of old and obsolete machinery with new, modern equipment. The old hand machines are a drag on production, not only because they are slower and require more hours of the workman's attention to operate, but because they can be run only by strong men." The report stressed that it does not urge the expanding of the total amount of machinery in the industry, but rather the "replacement of the old machines now in use."

The committee recommended such changes as higher hiring-rates, upgrading of workers in accordance with their ability to produce, equal pay for women workers doing the same jobs as men, and the speedier settlement of many delayed wage cases.

Kerber Quits WPB Post to Return to Hanna Furnace

Washington

• • • **William Kerber,** deputy assistant director of the WPB Steel Division, has resigned to resume his connection with Hanna Furance Corp. Mr. Kerber will have a new post of increased responsibility with his company, but the announcement of that will be made later by George R. Fink, president of National Steel Corp., of which Hanna Furnace is a subsidiary.

Steel Producers Asked to Report All Work Stoppages

Washington

• • • **Work stoppages** in the steel industry must be reported by telephone or telegraph to the WPB Steel Division if their effect on output is important, said Norman Foy, director of the Steel Division, last week. In instances of lesser importance, a report by letter will suffice, he added. Raw materials producers and foundries are included.

Navy Salvage Plan

(CONTINUED FROM PAGE 109)

rushes to the scene and goes to work. Scrap that is not usable in the combat area is shipped to the United States. Usable scrap is retained and parts are repaired, cleaned and put into stockpiles of the nearest supply depot. In a few days, or weeks, depending upon the amount of material available, the salvage crew cleans up the area and moves to another. On a landing operation it follows the path of the invading force.

At Oran, Algeria, a salvage crew recovered $50,000 worth of precious diesel engine parts. At Palermo, Italy, 20,000 tons of steel plates were salvaged. At one African landing spot 15 damaged invasion craft, almost covered by sand at the edge of the beach, were spotted. They were dug out and several tons of usable parts and equipment were salvaged. In a gravel pit in another battle area there were 23 heavy duty dump trucks in various stages of demolition. Several tons of usable wheels, tires, engine parts and body equipment were recovered. In one South Pacific area during a comparatively brief period, 24,695 tons of scrap valued at $536,202 were shipped back to the United States for reclamation and 25,408 tons of re-usable materials valued at $540,745 were put back into action in or near that particular area.

An amphibious operation nets the biggest return of all. Here salvage crews recover parts and equipment from ships, landing craft of all kinds, planes, tanks, jeeps, trucks, construction equipment and personal articles carried by the invading forces.

The Navy always had disposed of its salvage material by sale, and the method used was of the "scrap sale." Material that had been surveyed and declared of no further use to the Navy was placed in the scrap pile. Scrap dealers and other interested buyers were invited to submit bids and the sale was made to the highest bidder. In 1942 by order of the WPB and OPA, it was necessary to segregate and properly classify scrap in order that these agencies might control the price received for them and direct and regulate the shipment in regard to the needs of various consumers.

This segregation called for a high degree of technical skill, a knowledge of the requirements of individual mills and a background of business experi-

ence in the ways of ferrous and nonferrous metal industries.

To expedite this program, men of suitable background and with other required qualifications were commissioned in the Navy Supply Corps, and after a period of indoctrination were assigned to salvage duties in the various Navy yards and stations. The Bureau of Supplies and Accounts directed the sale and shipment of properly prepared and segregated scrap through the naval establishment and maintained close liaison with the interested war agencies. As a result of this program, WPB could direct the shipment of Navy-generated scrap to critical points on short notice.

Navy yards had always maintained "scrap yards." It was necessary to increase the size of these yards, install labor-saving machinery, and indoctrinate civilian personnel in the finer points of scrap handling. This was carried out by various salvage officers at the yards. The efficiency of this program was evidenced by an immediate drop in general sales and by the increased amount of material that was shipped direct to steel mills and foundries on allocations at OPA ceiling prices. By properly preparing this material and receiving the ceiling prices, the Navy was assured the greatest possible return on the sales.

While the Salvage Section originally was concerned with the disposition of salvage to naval activities, the Navy soon was faced with an entirely new problem, namely, the disposition of Navy-owned scrap at private plants. On all cost-plus-fixed-fee contracts the Navy owned all residual material left over from industrial operations, and it is the responsibility of the Bureau of Supplies and Accounts to dispose of this material to the best interests of the government. Directives were issued which employed the services of cost inspectors and technical inspectors who handled necessary sales under instruction of the Bureau. This had its beginnings with scrap, but contract terminations have brought all grades of materials and various items such as machine tools, plant equipment, consumers' goods, etc., into the disposition problem.

At the Lycoming Division in Williamsport, Pa., an agreement was worked out by an officer of the Material Redistribution and Disposal Branch whereby the subject company would accept for credit approximately 1800 engine boxes at a price of $11 each. This aggregates approximately $20,000 increased revenue for the Navy. Previously these boxes were scrapped. In addition to the monetary saving, there were also many man-hours and much lumber saved.

Commander Jack G. Bean
Officer in charge of the Material Redistribution and Disposal Branch

At some Navy activities before salvage officers were assigned, thousands of pounds of foundry slag and sand were disposed of by dumping. This material now is being saved and returned to the smelting plants where the copper is extracted and paid for and re-used.

At various Navy yards throughout the country where scrap was concentrated, cutting shears were installed which allowed for the proper preparation and segregation of scrap to the point that one freight car would hold the scrap that formerly occupied three cars. It saved time, transportation

facilities and got the scrap to the mills sooner and in better condition.

One unit based in North African waters is salvaging Italian steel and preparing scrap with the use of captured acetylene equipment, employing local workers. The cost of preparation is approximately 50c. per ton, the Navy says, while the same work performed on the East Coast would cost from $5 to $10 a ton. Formerly this material was unloaded on docks and shipped to a scrap yard where the material was prepared and reloaded on cars for a mill. Properly-prepared overseas, the material can be loaded into railroad cars and shipped directly to a mill. In addition, thousands of tons of steel are being distributed to repair bases for use in making temporary repairs on our ships.

Shell Program Holds Top Rating in Canada

Toronto

• • • **Releasing** of big shell contracts to Canadian producers has brought about almost an overnight change in Canadian steel markets. Shell steel now holds top priority, even overshadowing shipbuilding and other important war production. Labor markets also have been seriously affected and it is stated that anywhere from 10,000 to 15,000 workers will be required to man the dozen plants slated to turn out artillery shells. Plants already are being put in shape for big scale production and it is stated that they will maintain capacity operations for the next six months at least.

Two Hamilton plants will receive a substantial part of the new shell orders. Although officials of National Steel Car Corp., and the Steel Co. of Canada, Ltd., have not received details of the munitions program, they were advised some time ago to prepare for such a development. United States Steel Corp., Welland, is another plant affected by the new shell program.

Shipbuilding contracts involving $7,000,000 have been placed with two companies in Quebec. Contracts for two ships have been awarded to the George T. Davie Co., and for three ships to Morton Engineering & Drydock Co.

The awarding of new shell, landing barges and ship contracts in Canada, has practically wiped out any hope of large tonnage supply of steel for civilian use.

Aluminum Welding with Liquefied Gas

(CONTINUED FROM PAGE 67)

ing of sample plates, breakage occurred outside the fusion zone in all cases where complete penetration was obtained.

It was also noticed immediately that the welding operator had no trouble in setting a neutral or carburizing flame. In the training of aluminum welders, ordinarily this is one of the great difficulties encountered. From then on propane was used at the start for training operators and as they became proficient they were given lessons on welding aluminum with hydrogen, since both gases, propane and hydrogen, were used in production. Generally, a trainee has a great deal of trouble in welding aluminum with acetylene because of the higher temperature involved.

During preliminary testing, technique and procedure of handling propane for welding aluminum sheet metal and castings were set up. It was found that the gas pressures with propane differed slightly from that of hydrogen or acetylene. In welding aluminum with propane, the following pressures are used:

Diameter of Orifice of Tips, In.	Propane Pressure Lb. per Sq.In.	Oxygen Pressures Lb. per Sq.In.
0.035	½-1	2-4
0.055	¾-1½	3-5
0.065	1-2	4-6
0.075	1½-2½	5-7
0.085	2-3	6-8

In the manufacture of superchargers for aircraft, propane welding was done on 2S, 3S, 51S and 53S aluminum sheet metal ranging in thickness from 0.020 to 0.125 in. Tubing of 2S aluminum was fillet welded to aluminum alloy castings used on aircraft radiators. Many of these castings had sand holes which were repaired by welding. These assemblies were preheated to 600 deg. before welding. After all welding had been completed, the welded area was cleaned with a 5 per cent nitric acid solution at 150 deg. and rinsed in hot water.

It was noticed in welding with propane, a slight soot developed if the proper flame was not employed. This would tend to develop a scum on the surface of the casting, or the aluminum sheet or tubing, necessitating recleaning and fluxing before welding.

Installing this method of welding aided in reducing the demand for hydrogen which was getting very scarce. It also meant that production was not held up, and a slight reduction in cost of welding resulted. Probably hydrogen or acetylene will continue to be the most widely used gas in welding of aluminum, however, as the liquefield gases have their limitations.

o o o

GIBRALTAR REPAIR SHOP: *The Royal Naval Air Station at Gibraltar is a repair base as well as a base for operations against U boats. Here, a group of Fleet Air mechanics are putting an over-hauled engine into a Beaufighter.*

o o o

Steel Union Shows Increase of $766,844 In Its Net Worth

Pittsburgh

• • • **The third** semi-annual public financial report of United Steelworkers of America, issued recently, discloses the union has a net worth of $3,313,077, or a gain of $766,844 since the close of the previous audit six months before.

As of Nov. 30, 1943, the closing date of the audit, the union had $3,604,111 in money and other assets, and had current obligations at that time of $291,034. The operation and maintenance of the 39 districts and the international office during the six-month period caused an expenditure of $1,646,852. The regularly employed personnel assigned to the districts numbered 576 people, while occasionally employed members of local unions numbered 1413.

Local unions chartered by the organization on Nov. 30, 1943, numbered 1813, with a claimed membership of 936,500, a gain of more than 200,000 since the last report.

Summary Statement of Initiation Fees, Dues, and Per Capita Refunds, by USWA Districts—June 1 to Nov. 30, 1943

	DISTRICT	Receipts		Per Capita Refunds	
		Initiation Fees	Dues	Initiation Fees	Dues
1	New England	$ 7,107.00	$ 80,991.98	$ 2,415.67	$ 20,491.31
2	New York City	9,863.00	81,012.59	3,287.68	20,516.65
3	Utica, N. Y.	4,944.00	57,513 00	1,648.00	14,378.25
4	Buffalo, N. Y.	9,554.00	145,602.00	3,862.67	36,400.50
5	Eastern Canada	27.00	37,652.89	9.00	9,413.20
6	Central and Western Canada	2,190.00	84,078.05	730.00	20,954.77
7	Philadelphia	15,613.00	184,871.35	5,204.33	46,154.28
8	Baltimore	2,955.00	55,654.00	1,185.00	13,913.50
9	Bethlehem, Pa.	8,452.00	103,174.00	5,126.33	25,798.75
10	Wilkes-Barre	2,737.00	41,864.00	912.33	10,466.00
11	Harrisburg	2,358.00	126,223.25	786.00	32,037.95
12	Johnstown, Pa.	3,702.00	75,166.00	1,732.00	17,880.75
13	Charleroi-Monessen	4,959.00	88,953.00	1,881.00	22,238.25
14	McKeesport	186.00	69,285.00	756.50	17,321.25
15	Homestead	11,894.00	139,512.80	7,727.99	34,958.20
16	South Side-Hazelwood	4,740.00	62,083.25	2,594.00	15,666.88
17	Lawrenceville-North Side	5,120.00	50,459.00	1,706.67	12,608.50
18	McKees Rocks	9,480.00	80,327.42	3,160.00	20,077.63
19	Tarentum	11,362.00	157,994.00	4,571.32	39,232.52
20	Ambridge	16,599.00	162,725.25	5,533.00	42,353.45
21	Sharon	12,395.00	121,448.30	5,854.66	30,647.40
22	Charleston, W. Va.	868.00	27,600.00	239.33	6,896.25
23	Steubenville-Wheeling	8,793.00	111,232.00	2,931.00	27,934.55
24	Columbus	6,471.00	52 974.40	2,157.00	14,641.05
25	Cincinnati	3,069.00	32,368.75	1,023.00	7,917.50
26	Youngstown	6,339.00	176,613.50	2,529.00	44,171.63
27	Canton	5,805.00	126,706.00	2,080.00	31,679.00
28	Cleveland	11,312.25	163,450.00	6,240.75	44,719.15
29	Detroit	9,537.00	71,604.00	4,427.00	18,619.25
30	Indianapolis	12,453.00	91,506.90	4,150.99	24,135.60
31	Calumet	45,378.00	453,134.22	16,634.00	113,673.68
32	Milwaukee	10,936.50	128,382.30	3,645.50	33,998.25
33	Minnesota and Iron Ranges	8,793.00	128,468.00	2,926.50	32,603.65
34	St. Louis	19,890.00	124,259.80	6,629.98	36,401.79
35	Southeastern	1,690.50	12,308.00	562.42	3,281.48
36	Southern	6,607.50	88,979.50	2,202.48	22,472.25
37	Texas	259.00	25,798.00	86.33	7,085.25
38	West Coast	26,002.50	146,131.30	9,405.50	44,912.65
39	Utah	551.50	11,547.38	183.84	5,202.83
	TOTALS	$330,992.75	$3,979,655.18	$128,778.77	$1,023,855.78

AIS Form 10 Reported Being Revised

Pittsburgh

• • • **A revision,** which will clarify steel finishing capacity, finished steel production, and actual steel shipments, is being made by the American Iron & Steel Institute on its monthly report known as AIS Form 10. This report covered capacity and production for sale. The newly revised form, which probably will be sent to members in the near future, will contain actual production figures of various steel products, as well as actual shipments of these products.

The production of finished steel products, heretofore, included only those products which were made for sale. The new form will have a column which will indicate the actual production of a given product from the mill making that product, regardless of whether it is utilized in the same company for further processing. Obviously, such production cannot be totaled.

A column showing actual shipments of steel products, which will indicate the production for sale of various items, is included in the new form, and is practically the same as the column utilized in the former form.

With the newly revised AIS 10, steel companies and analysts will be able to determine the actual annual capacity for producing specific steel products in case unlimited supplies were available, the actual production of specific steel products on mills for that purpose, regardless of whether they are further processed by other units within the companies, and, finally, an actual monthly record of shipments covering various iron and steel products to the trade.

Metal Can Shipments*

Monthly Shipments by Manufacturers of All-Metal Cans, Net Tons of Steel

Months 1943	Fruits & Vegetables	Dairy Products	Meats	Fish Sea-Food	Military Rations	All Other Food	All Non-Food	Monthly Total for All Products
January	28,931	18,829	15,863	4,084	8,293	9,885	8,169	94,054
February	26,817	19,618	16,063	5,492	6,175	9,215	7,522	90,902
March	29,484	25,531	15,396	5,287	6,046	10,608	9,721	102,073
April	34,980	28,481	14,099	5,391	4,310	11,016	10,746	109,023
May	44,013	32,191	14,283	9,890	2,323	9,709	10,017	122,426
June	84,891	34,984	13,801	5,891	3,209	10,595	11,382	164,753
July	128,103	30,909	13,920	9,310	2,913	10,878	10,956	206,989
August	155,294	25,797	13,362	8,977	2,221	19,080	11,656	236,387
September	126,420	22,993	10,963	8,434	5,485	21,901	11,780	207,976
October	68,233	19,317	10,763	7,659	5,409	14,370	10,889	136,640
November	32,818	16,018	12,261	7,149	5,456	16,355	10,690	100,747
December	36,848	17,367	13,276	5,422	5,438	19,719	14,428	112,498
Total	796,832	292,035	164,050	82,986	57,278	163,331	127,956	1,684,468
1944								
January	34,857	19,889	14,082	3,843	6,411	14,989	14,268	108,339
February	40,335	22,437	13,611	4,605	6,074	16,772	12,177	116,011

* Metal can as referred to here is an unused container made wholly from tin plate, terne plate, blackplate, or waste plate to be used for packing the products shown in the table. Shipment data include cans shipped by "commercial" manufacturers to packers and cans produced and used by canners in "captive" plants for their own pack. Statistics are the tonnage equivalents to the base boxes of steel reported by the present industry of 94 companies comprising 196 manufacturing plants.

Wire used in the production of keys and can handles is not included. The production of these items consumed 1529 tons of carbon steel during 1943 and 593 tons in January and February of 1944. (Source: WPB Containers Division)

MACHINE TOOLS

. . . News and Market Activities

Influx of Orders Raises New Problems

Cleveland

• • • **Four** major "emergency urgent" military programs are soon expected to administer a potent medicine to the machine tool industry which will stimulate its activities and stop the steady decline of the past year in both orders and shipments but at the same time inflict a terrific production headache.

These programs include heavy artillery and shells, truck axles, changes in aircraft and new landing craft.

GM tells machine tool makers about its maintenance problem. See "Assembly Line," page 78.

They will all require new machine tools quickly and the Army appears to be poised to release up to three-quarters of a billion dollars worth of new machine tool orders for delivery in 1944.

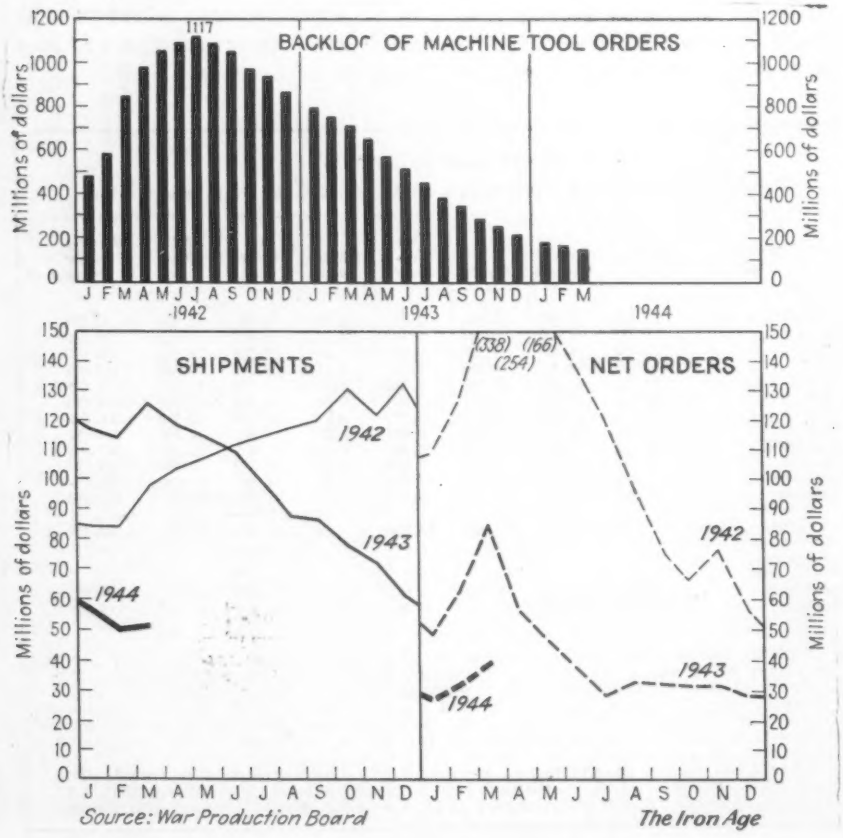
While the machine tool industry would like to keep busy in its own line of endeavor there is still some question whether the Army's solution to its production problem is correct. Most machine tool shops are already jammed with subcontract work, much of which ties up facilities for a long period. Labor is extremely short and getting worse as the draft inroads increase. The added burden of a multi-million dollar lot of new machine tools to contend with after the war in addition to those which have been produced within the last two years, also finds little favor. The lack, or apparent lack, of a concerted effort by the Army to first utilize the idle and excess machine tools already built has also drawn some comment.

Admittedly the machine tool builders' picture has not been one of a healthy business for some time. Orders in the first three months of the year had sunk to around $30 million per month and recorded something of a record in March when new orders climbed to $40 million but were still led by shipments of about $50 million which continued to cut backlogs of unshipped orders.

Observers, taking the long term point of view for the good of the machine tool industry, foresee in this abrupt and huge Army order for new tools a tremendous waste of critical manpower and materials at a time when there are estimated to be as many as 200,000 idle or excess machine tools in the nation's production facilities. The Army is criticized for opposing the greater use of pool orders which might have supplied many of the now needed tools from stock.

On the other hand the Army's point of view in not permitting the stripping of idle tools from plants is credited with having good grounds in necessity. The Army demands that plants be held in "standby" condition for sudden production requirements. Stripping such plants of idle equipment would jeopardize this aim.

Regardless of the right or wrong of the question there is little doubt that the machine tool builders will again be busy and producing at a frantic pace. The Army is already known to be inquiring for shell lathes and the Cincinnati district reports an unexpected inflow of new military orders for tools which proves that the program is getting underway immediately. The emergency urgent rating on such tools will cause them to supersede all other production.

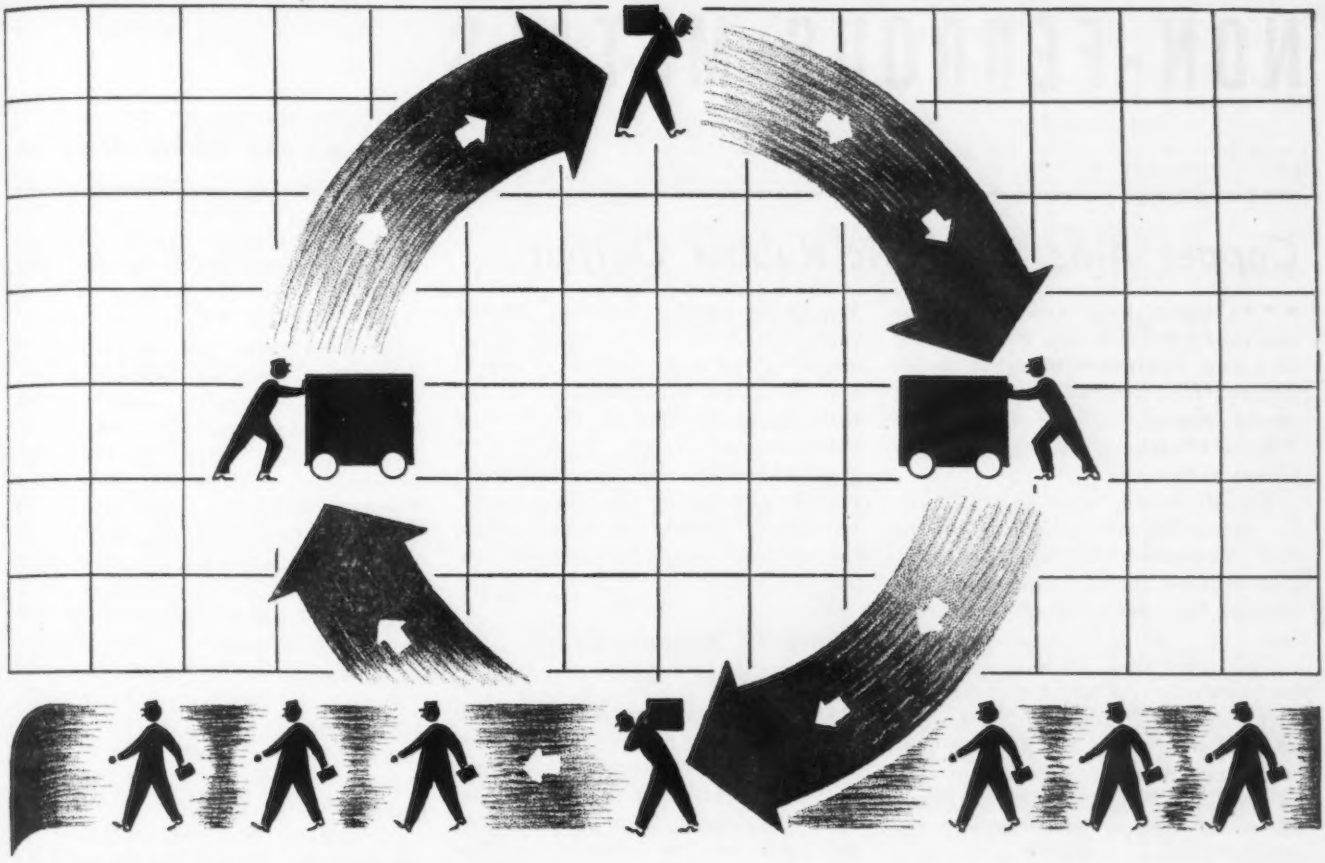


Machine Tool Orders And Shipments Gain

• • • Machine tool shipments in March were valued at $50,799,000, an increase of nearly 1½ per cent over the $50,098,000 total in February, according to a preliminary report issued by the WPB Tools Division. The increase in shipments is the first shown since March, 1943, when shipments totaled $125,445,000.

Orders for machine tools received in March of this year were valued at $41,854,000, an increase of 19.6 per cent over the February total of $34,995,000. February orders received were 12.7 per cent over January. Increases in orders are attributed to increases in some military programs, including the truck and airplane engine programs. Cancellations in March totaled $1,847,000, compared with February cancellations of $1,725,000. Net new orders for march were $40,007,000, compared with $33,270,000 for February.

The backlog of unfilled orders at the end of March was valued at $155,079,000, a decrease of 6.9 per cent from the $164,424,000 backlog at the end of February.

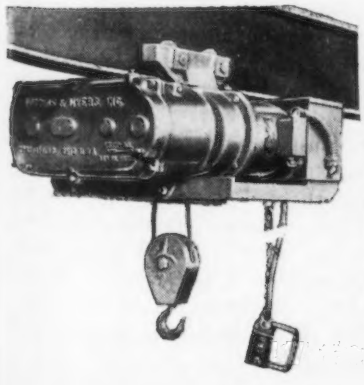


GET OFF THE MANPOWER MERRY-GO-ROUND!

Every labor-saving machine you install, every labor-saving method you adopt, helps stem the production-dwindling effect of labor turnover—the manpower merry-go-round.

And while we do not claim that R & M Hoists will banish this vicious circle for you, they *can* reduce its effect by permitting you to multiply greatly the capacity of fewer workers. A comparatively small percentage of steady workers upon whom you have come to count can—with greater ease for themselves—hold the production line in the face of increasing turnover.

Eliminate the need for muscle and you make the most of today's manpower. You can do that, NOW. Here are two of the many R & M Hoists ready for quick delivery.



The R & M Type F½ Hoist has 1000 — 2000-pound capacity. It is provided with pendent, push-button control. A step forward in improved design, better materials, and manufacturing economies that provide a better hoist at lower cost in both purchase price and operation.

The R & M Type F Hoist has 1000 — 15,000 - pound capacity. Push-button control is standard. Operating with low headroom and handling loads from any angle with perfect balance, the Type F Hoist makes a one-man job of many otherwise cumbersome operations.

GET IN TOUCH WITH YOUR NEAREST R & M SALES AND SERVICE OFFICE . . .

Albany . . . . . 364 Broadway
Atlanta . . . . . 319 Walton Bldg.
Baltimore, Lombard & Concord St.
Boston . . . . . 74 Needham St.
Chicago . . . 2400 W. Madison St.
Cincinnati . . . . . 418 New St.
Cleveland . 470 Rockefeller Bldg.
Denver . . . . . 1420 16th St.
Detroit . . . . . 2921 E. Grand Blvd.
Houston . . . . 3715 Harrisburg Blvd.
Jacksonville . . . . . 305 Bisbee Bldg.
Kansas City, Mo. . . . . 215 Pershing
Meriden, Conn . . . . 135 Colony St.
Newark . . . . . 700 Bergen St.
New York . . . . . 200 Varick St.
Philadelphia . . . . 401 N. Broad St.
Pittsburgh . . . . H. W. Oliver Bldg.
Providence . . . . . 44 Clifford St.
San Francisco, 116 New Mtgmry St.
Seattle . . . . . 216 Walker Bldg.
Syracuse . . . 204 State Tower Bldg.
Montreal . . . . Lyman Tube & Supply Co., Ltd.

ROBBINS & MYERS • INC.

HOIST & CRANE DIVISION • SPRINGFIELD, OHIO

In Canada: Robbins & Myers Co., of Canada, Ltd., Brantford, Ont.

MOTORS • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878

NON-FERROUS METALS

. . . News and Market Activities

Copper Aids Synthetic Rubber Output

• • • **Copper, long avoided** by the natural rubber industry, was disclosed as a new and powerful agent in the production of synthetic rubber at the recent meeting of the Division of Rubber Chemistry of the American Chemical Society.

This discovery, reported by Dr. A. A. Somerville, vice-president of the R. T. Vanderbilt Co., New Yorw, will, it is believed, increase the output and improve the quality of synthetic rubber.

Two new vulcanization accelerators for synthetic rubber, both chemical compounds of copper, were announced in a paper on "A GR-S Vulcanization Catalyst" read by Dr. Somerville. "These two accelerators, known as 'Cumate' and 'Cuprax,' are several times as powerful as the conventional type now in use in the rubber industry; and we belive that this greater activity is due to the fact that they are compounds of copper," Dr. Somerville declared.

Why copper speeds vulcanization is still a mystery, Dr. Somerville said, in explaining the new development. "If you add a very small proportion of ordinary 300 mesh copper powder to properly compounded Buna S, the big tonnage synthetic rubber, and vulcanize the mix in a mold in a laboratory press under standard conditions, you will find that this addition of copper has shortened the time of vulcanization to less than half the normal time," Dr. Somerville said.

"We don't know what there is about copper that is responsible for this fact, but the observation itself has been repeated a hundred times. The proportion of copper may be as little as 0.01 per cent by weight on the synthetic rubber, or it may be as much as 1 per cent of the rubber; it doesn't make any difference, the result is the same in all cases.

"Sixteen other metals, in addition to copper, were tried and found to be without effect, while a large number of chemical compounds of copper were tried and found to be effective.

"Various chemical compounds of copper have been used experimentally for the chemical treatment of various rubber compounding ingredients, and the characteristic effect of copper is observed in every instance," Dr. Somerville added. "Twenty different samples of Buna S were tested before and after the incorporation of copper and the effect was found to be the same for each sample. The time of vulcanization of all samples was greatly reduced, and variability in rate of vulcanization was also reduced. Laboratory results to date indicate that copper has no effect in butyl rubber or Thiokol."

•

Bimetallic Standard Urged

Washington

• • • **Predicting a universal** demand after the war for a return to hard money, Francis H. Brownell, chairman of the board of directors of the American Smelting & Refining Co., told the House Foreign Affairs Committee on April 28 that monetary stabilization would be vastly facilitated by the adoption of international bimetallism.

Pointing out that the world's monetary silver stock is about 6,000,000,000 oz. compared with world monetary gold stocks of about 960,000,000 oz., worth, at $35 per oz., a little over $33½ billion, Brownell emphasized that international bimetallism is the cure for the physical scarcity of the yellow metal.

By restoring silver as a monetary metal, and pegging its price as England pegged the price of gold, monetary silver would, in effect, be added to the supply of physical gold so as to provide an adequate supply of hard money without impairing or diminishing the full use of gold, and gold would continue to be used as much as under the single gold standard.

•

Mine Output of Ni Drops 10%

Toronto

• • • **In 1943 International** Nickel Co. of Canada produced or refined nearly 300,000,000 lb. of nickel for war use, according to Robert C. Stanley, chairman and president. Even so, mine output for the last half year dropped 10 per cent below the increased capacities.

Copper deliveries in all forms, including copper in "Monel" matte and copper refined for others, amounted to 316,000,000 lb. compared with 336,000,000 lb. in 1942. All refined copper was delivered to the United Kingdom and Canada, the latter using about 70 per cent.

Of the great toll in the form of nonreplenishable ore reserves the company is paying under its war production expansion program, Mr. Stanley said: "At the annual meeting two years ago I stated that war requirements of nickel by the United Nations forced the discontinuance of our long-term economic mining plan—that we had undertaken a production expansion program involving a capital outlay of nearly $35,000,000—and that this program called for the opening of additional ore properties, the sinking of mine shafts and the installation of surface and underground plant and equipment, as well as the enlargement of concentrating, smelting and refining works.

"I mention this drain on our ore reserves which is serious but not irreparable. It would be less pronounced if we had not suffered a severe labor shortage which prevented mine development work so necessary in times of accelerated ore production.

•

For the Record

• • • **Four of Basic Magnesium,** Inc.'s 10 production units at Las Vegas, Nev., have been ordered closed, but kept in condition for resumption. No widespread layoffs are contemplated by the management however.

• • • **Aluminum salts shipped** in the United States in 1943 increased 6 per cent in quantity and 13 per cent in value over 1942, according to the Bureau of Mines. Producers reported the shipment of 642,822 net tons valued at over $20 million compared with 604,558 tons valued at more than $17 million in 1942.

• • • **Gold production from** domestic mines was 91,154 fine oz. in January, a decrease of 10,433 fine oz. from the December production of 101,587 oz. Daily average production dipped to 2940 oz., lower than at any time in 1943.

• • • **Non-ferrous scrap dealers** reported a falling off of activity during the month of February, the Bureau of Mines reports. Dealers receipts fell 3 per cent to 81,051 tons, shipments declined 6 per cent to 83,912 tons, while stocks decreased 3 per cent to close at 107,261 tons at the end of the month.

REFINER, SMELTER PRICES

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd	15.00
Aluminum, No. 12 Fdy., (No. 2)	12.00
Aluminum, deoxidizing grades	11.00 to 12.25
Antimony, Asiatic, New York	Nominal
Antimony, American, f.o.b. Laredo, Tex.	*14.50
Arsenic, prime white, 99%	4.00
Brass, 85-5-5-5 ingots (No. 115)	13.00
Cadmium, del'd	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
Copper, electro, Conn. Valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Copper, beryllium, 3.75-4.25% Be; dollars per lb. contained Be	$15.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$7.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	30.00
Mercury, dollars per 76-lb. flask, f.o.b. shipping point or port of entry	$191 to $193.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.87
Copper, H.R.	....	17.37	....
Copper, drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercal bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 3S (½H): 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness: 2S and 3S, 22.7c. a lb.: 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 34c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths, 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums)

Copper, Copper Base Alloys

OPA Group 1

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	**8.75**
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	**8.50**
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

OPA Group 3

Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4

Automobile radiators	7.00

OPA Group 5

Refinery brass	5.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

All S-type alloys (except 2S)	8.50
2S solids	8.00
High grade alloys	7.00
Low grade alloys	6.50
Borings and turnings	
High grade alloys	5.50
Low grade alloys	5.00

Plant scrap, mixed

All solids	6.00
Borings and turnings	4.00

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	7.00
Old castings and forgings	6.50
Pistons, free of struts	6.50
Pistons, with struts	4.50
Old alloy sheet	5.50

For old castings and forgings, pistons, sheets, add ½c. lb. for lots 1000 to 19,999 lb.; for other scrap add 1c.; for lots over 19,999 lb. add 1½c. a lb.

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	8.00

Mixed, contaminated plant scrap

Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

Zinc

New zinc clippings, trimmings	7.25
Engravers', lithographers' plates	7.25
Old zinc scrap	5.75
Unsweated zinc dross	5.50
Die cast slab	5.50
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass: Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00–13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82–41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

SCRAP

. . . News and Market Activities

Use of Coal in Briqueting Turnings Described at Foundry Show

Buffalo

• • • **By taking advantage** of the plasticity of certain coals when heated, it may be possible to salvage for production of cast and malleable iron loose machine shop turnings which are now one of the big salvaging headaches. The method was discussed April 27 by Dr. H. W. Gillett, of Battelle Institute, Columbus, Ohio, before the Third War Production Congress and 48th annual meeting of the American Foundrymen's Association, at Buffalo.

Speaking on raw materials for cupola operation, Dr. Gillett described experiments at Battelle in which machine shop turnings, borings and chips were made into briquets suitable for charging foundry cupolas by mixing this loose scrap with certain types of coal, then coking the mass into briquets. If the economics of the process can be proved feasible, it may offer a solution to the problem of how to utilize fine scrap from the nation's war industries in the manufacture of cast and malleable iron.

Changes in the OPA price schedule bringing imported scrap under dollars-and-cents ceilings are described on page 110.

As explained, it is impossible to use fine scrap in loose form in the foundry cupola because of the technology of the cupola process. Gigantic presses are used to press fine scrap into briquets in plants where the volume of such scrap is great, but few industries produce enough scrap of this type to keep a huge press in operation. As a result, large tonnages of such scrap usually end up in outside "storage" of industrial plants, where it rusts and deteriorates before it is eventually sold at depreciated value to steel manufacturers for use in open hearth or blast furnaces. A cheap means of converting fine scrap into briquets for cupolas while it is still in the plant of its origin and where its composition is known would make practical the use of the material in local foundries.

Coke bonded briquets, according to Dr. Gillett, can be handled with a magnet and will stand storage and shipment almost like pig iron. It is believed that under local conditions, where loose turnings and chips have little value because of the difficulty of handling and storing, and because of the distance from open hearth and blast furnaces that can use loose material, the method of briqueting might be the practical solution to this salvage problem.

•

PITTSBURGH — Open hearth scrap supplies have become tighter here recently, with buyers actively soliciting tonnages. While no severe shortages have developed, supplies are less plentiful than a month ago for open hearths when gaged with present demand. Dealers low phos has been going begging in the past week. Industrial low phos usually finds a home.

•

CLEVELAND—Scrap demand has hit something of a peak here with good demand on all desirable grades both for delivery in Cleveland and the surrounding area. Pittsburgh, which has been drawing rather heavily on Cleveland scrap in past months, is gradually being squeezed out. Mahoning Valley demand has been good. Scrap supplies, while adequate, are not excessive in any grade except alloys. Alloy movement is reported off with prices seeking a new low. Carbon prices are firm and at ceilings. Blast furnace borings and turnings listed as in excess not many weeks ago have moved out of that category. Cast scrap is still the market's scarcest item.

•

BUFFALO—With turnings at a standstill, one Buffalo dealer is reported to have offered a leading consumer 5000 tons of heavy melting if he will also take 1000 tons of turnings. Other dealers, still burning over this consumer's success in stocking up on turnings at 75c. below ceiling, insist there isn't that much heavy melting in the district. This lack, however, is being rectified by heavy shipments from the Atlantic seaboard, all going to the two largest buyers. Despite the first break below the code, buyers and sellers agree there is no further softening evident in the local market. Cast, No. 1 heavy melting, and cast iron borings remain scarce. One small mill reports a full supply of No. 2 heavy melting on hand and no room for additional shipments for the time being.

•

BOSTON—Following the recent reaction, prices on turnings have stabilized. Mills are more careful in accepting scrap. Rejections of turnings have become frequent; a shipper of three cars of government wire material, presumably offgrade, reported a $3 a ton cut by a mill; and shipments of other scrap have been questioned. Yardsmen say rejections are due to the unsettled mill labor situation.

•

CINCINNATI — The market continues very slow, although the demand for good grades of steel and cast scrap is good. Dealers, however, indicate that good scrap is very noticeable by its absence in the market, so that consumers are only taking as they need it at the present time, but the pressure on specifications continue. Turnings for shipment out of the market are reported to be going at from $1 to $2, in some instances, under the ceiling prices, but sales within the district are being held firmly at ceiling prices.

•

BIRMINGHAM—Heavy and continued rains in this area slowed down an already slow movement of material, and demand except for blast furnace and open hearth grades remains very light.

•

LOS ANGELES — During May major California mill purchasers of scrap will accept shipment of No. 1 melting grade for $1 below ceiling and of No. 2 and dealers bundles at $2 below ceiling. Dealers and scrap producers are now required to ask permission to over-ship. Last month a California purchase of 4000 or 5000 tons was reported consummated as low as $4.50 below ceiling.

•

MILWAUKEE—The shortage of labor in wrecking yards, together with transportation difficulties, caused a serious drop in the production of industrial scraps for March in this district, according to H. M. Steussy, chief of salvage for the WPB. Cast iron and heavy melting have become the most critical items.

•

PHILADELPHIA — Several mills here are still refusing to pay the entire springboard on open hearth grades or turnings. One large consumer while not paying the springboard on turnings is, however, receiving allocations for open hearth scrap. Scrap buyers are tightening their analysis requirements. The dearth of cast scrap continues while alloys and low phos remain difficult to sell.

•

DETROIT — The market has firmed modestly here. Blast furnace grades are active at ceiling prices; heavy melting scrap, with no current buying for local account, is moving out of town on allocations; alloy scrap continues unwanted, going when sold without premiums for alloy content. However, sales of moly scrap are being made with the premium.

•

ST. LOUIS—Shortage of labor in the steel mills and in the scrap processing yards is serious. Country dealers also complain that loss of manpower is affecting their operations, thus cutting down on shipments of scrap. The worst Mississippi River floods in 99 years are also halting the movement of scrap, with several of the yards in the district under water.

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES									
							Low Phos.		Heavy Structural and Plate			Foundry Steel				
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Blk. Shts. No. 1 & 2 Bundles No. 1 Busheling	Unbaled* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shovelling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crankshafts	Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$15.00	$15.00	$16.00	$17.00	$17.50	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.28
Duluth, Minn.	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	18.85
Toledo, Ohio	.....	12.85	12.85	13.85	14.85	15.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis, Mo.	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles, Pittsburg, Cal; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.50	15.50	12.50	14.00	15.50

* Baled turnings are $5 per gross ton higher.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

AT NEW YORK CITY or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on trucks. Minimum set at $14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing point (cents per gross ton) are: Chicago, 84c.; Pittsburgh, Brackenridge, 55c.; Detroit, 53c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, Pittsburg, 42c.; Seattle, 38c.; Buffalo, Claymont, Harrisburg, 36c.; Atlanta, Birmingham, 32c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Phoenixville, Bethlehem, Kokomo, Duluth and St. Louis, 28c.; Alabama City, Ala., 26c.; Minnequa, Colo., 22c.; Middletown, 14c.; Conshohocken, Sparrows Point, 11c.

*Basic open hearth and foundry grades, and auto springs and crankshafts, deduct 80c. per ton.

BASING POINT includes switching districts of city named.

Basing point	Switching districts:
Pittsburgh	Bessemer, Homestead, Duquesne, Munhall, McKeesport
Cincinnati	Newport
St. Louis	Granite City, E. St. Louis, Madison, Ill.
Chicago	Gary
Claymont	Chester, Pa.
San Francisco	So. San Francisco, Niles, Oakland

MAXIMUM SHIPPING POINT PRICE: Where shipment is wholly or partially by rail or vessel, or combination of rail and vessel, the scrap is at shipping point when placed f.o.b. railroad or f.a.s. vessel. For motor vehicle shipments scrap is at shipping point when loaded. Then maximum shipping point price shall be: (a) For shipping point located within a basing point, prices shown in above table for scrap at basing point in which shipping point is located, minus applicable switching charge deduction shown in paragraph above labeled "Switching Charges." (b) For shipping points outside basing point, price listed in above table hereof for scrap at most favorable basing point, minus lowest charge for transportation from shipping point to such basing point by rail or water carrier or combination. Where vessel movement is involved, in lieu of established dock charge or any cost customarily incurred at the dock, 75c. per ton must be included as part of deduction in computing shipping point price; 50c. at Memphis; $1 at Great Lakes ports; and $1.25 at New England ports. If no established transportation rate exists for a portion of movement from shipping to basing point, actual charge or cost customarily incurred by shipper in such portion of movement shall be included as part of deduction in computing shipping point price. For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made $4) less than maximum prices for the corresponding prepared scrap. In no case, however, shall electric furnace, acid open hearth and foundry grades be used as the corresponding prepared scrap. A preparation-in-transit charge for unprepared scrap is provided.

NEW LISTED GRADES: Priced in dollars per gross ton less than No. 1 heavy melting steel. Pit scrap, ladle skulls, slag reclaim, etc., of 85% or more Fe priced less $2; 75 to 85% Fe less $4; under 75% Fe less $8 per ton. Mill scale less $8 per ton. Mill cinder and grindings, shipping point maximum price of $4 per gross ton at all U. S. shipping points.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1% oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5% oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c. mill scale, $8 less than No. 1 heavy melting.

Tool Steel Scrap Prices (MPR 379)

	SEGREGATED Solids Per Lb. Cont. W	SEGREGATED Turnings Per Lb. Cont. W
Type 1. 12% min. W, 1% max. Mo	$1.80	$1.60
Type 2. 5 to 12% W, 1% max. Mo	1.60	1.40
Type 3. 1 to 5% W, 1.5% max. Mo	1.25	1.25
*Type 4. 7% min. Mo, 2% max. W	0.125	0.105
*Type 5. 3.5 to 6% Mo, 4.5 to 6% W	0.135	0.115

UNSEGREGATED SOLIDS	UNSEGREGATED TURNINGS
$1.50 per lb. contained W if 5% or more.	$1.30 per lb. contained W if 5% or more.
$1.15 per lb. contained W if 1 to 5%.	$1.00 per lb. contained W if 1 to 5%.
$0.80 per lb. contained Mo if 1.5% or more.	$0.70 per lb. contained Mo if 1.5% or more.

If both W and Mo are within ranges, payment may be for both W and Mo content.

*Per lb. of scrap material.

If segregated, a premium of $1.50 per lb. of contained Co allowed if Co content is 3% or over. No scrap considered segregated if Co content ranges between 0.5 and 3%.

If Cu or Ni content over 0.25%, price shall be reduced by 50%.

If 500 lb. or less is sold, either segregated or unsegregated, price shall be reduced 2c. per lb. of scrap material.

Cast Iron Scrap

Maximum on-line price, per gross ton, for any of the following cast grades will be the price shown at the highest priced zone in which the railroad operates or is located.

	Per Gross Ton		
	Zone A	Zone B	Zone C
Cast Iron, No. 1	$18.00	$19.00	$20.00
Cast Iron, No. 2	17.00	18.00	19.00
Cast Iron, No. 3	14.50	15.50	16.50
Cast Iron, No. 4	13.25	14.25	15.25
Cast Iron Brake Shoes	13.25	14.25	15.25
Malleable	20.00	21.00	22.00
Wheels, No. 1	18.00	19.00	20.00

Zone A includes Mont., Idaho, Wyo., Nev., Utah, Ariz., and N. M. Zone B includes N. D., S. D., Neb., Colo., Kan., Okla., Texas, and Fla. Zone C includes all states not named in zones A and B, and includes switching district of Kansas City, Kansas-Missouri.

For cast, an in-transit preparation fee will be applicable only for preparing Cast ron No. 3 into Cast Iron No. 1, for which the maximum preparation fee shall be $3.50 per gross ton. (Previous dealer fee was $2.50.)

CAST IRON GRADE DEFINITIONS: Cast Iron No. 1—Cast Iron scrap such as columns, pipe, plates and/or castings of miscellaneous nature, but free from stove plate, brake shoes, and/or burnt scrap. Must be cupola size not over 24 x 30 in. and no pieces to weigh more than 150 lb. Free of foreign material. No. 2—Cast iron scrap in pieces weighing over 150 lb. not more than 500 lb. and free from burnt cast. No. 3—Cast iron scrap in pieces over 500 lb., includes cylinders, driving wheel centers, and/or all other castings. Free from hammer blocks or bases. No. 4—Burnt cast iron scrap such as grate bars, stove parts, and/or miscellaneous burnt scrap. No. 5—Driving and/or car brake shoes of all types except composition filled. Malleable—Malleable parts of automobiles, railroad cars, and locomotives. No. 7—Wheels, No. 1, includes cast iron car and/or locomotive wheels.

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	May 2, 1944	April 25, 1944	Mar. 28, 1944	May 4, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	May 2, 1944	April 25, 1944	Mar. 28, 1944	May 4, 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	23.94	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.375
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 161-169.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
May 2, 1944	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	HIGH	LOW	HIGH	LOW	HIGH	LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Prices of Finished Iron and Steel . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price to be used in figuring annealed, bright finish wires, commercial spring wire.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	[10] Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes[2]	3.80¢	3.80¢	3.80¢									4.55¢		4.16¢	4.12¢
Hot Rolled Strip[2]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold Rolled Strip[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢	3.31¢	
Coke Tin Plate, Base Box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
.50 } Electro Tin Plate, Box	$4.50	$4.50	$4.50						$4.60						
.75 } Electro Tin Plate, Box	$4.65		$4.65						$4.75						
Black Plate (29 gage)[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.37¢
Mfg. Ternes, Special Box	$4.30	$4.30	$4.30						$4.40						
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail Steel Bars[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (Billet) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢[13]	2.25¢	2.39¢	
Reinforcing (Rail) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢	c2.55¢[13]	2.25¢		2.47¢
Cold Finished Bars[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit = 2.70¢)		(Toledo = 2.80¢)				2.99¢	2.97¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢	(Bethlehem, Massillon, Canton = 2.70¢)						2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	(Coatesville and Claymont = 2.10¢) 2.10¢	2.35¢		2.45¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Bethlehem = 2.10¢)				2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R 0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
Bright Wire[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)			(Duluth = 2.65¢)		3.10¢			2.92¢
Galvanized Wire	Add proper size extra and galvanizing extra to Bright Wire base.														
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)					3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.50¢						2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. $34 Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel Co. $47.50.

Blooms—Phoenix Iron Co. (rerolling) $41, (forging) $47.

Sheet Bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto; Phoenix Iron Co. $47.00 mill.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. (small) $36 Portsmouth, Ohio; (blooming mill sizes) applicable base, f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.69 Birmingham; Ford Motor Co. $34 Dearborn, Mich.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts., (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing pts.

Bar Size Shapes—(Angles) W. Ames & Co., 10 tons or over, $3.10 mill.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp. $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. $3.20 Pacific Ports.

Merchant Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp., $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co. $2.35 Chicago; Central Iron & Steel Co. $2.20 basing pts.; Granite City Steel Co. $2.35 Granite City; Calumet Steel Div., Borg Warner Corp. (8 in. mill bars) $2.35 Chicago; Knoxville Iron Co. $2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel) $2.35 mill; Columbia Steel Co. $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England. Buffalo c.f. base plus c/l freight Buffalo to Massfield, Mass., f.o.b. Massfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas, Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co. $2.30 Chicago; Knoxville Iron Co. $2.25 basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co. $3.85 Parkersburg; Apollo Steel Co. $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill at $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendments to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-48 Ann.
**Philadelphia	3.518	4.872[8]	5.018a	3.922	4.772	3.605	3.666	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.613[3]	5.010	3.974[6]	4.772	3.788	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.887	7.087	7.087	8.137
*Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.00[4]	3.70	4.65[917]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.46	5.257[4]	3.86	4.35[17]	3.813[3]	3.813[3]	3.763[3]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.783	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	8.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.813[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.06[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

NATIONAL EMERGENCY (N. E.) STEELS
(Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar-Strip	Billets, Blooms and Slabs	Bars and Bar-Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35				.10c	$2.00		
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25c	$25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20				.40	8.00		
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20				.40	8.00		
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25			.65	13.00		
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40			.65	13.00		
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9537*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9545*	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

*Recommended for large sections only. Note: The extras shown are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, $5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.

Base Quantities

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(*) Philadelphia: Galvanized sheets, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton 54.00
Price delivered Detroit $2.00 higher; E. Michigan $3.00 higher.

Shell Steel

	Per Gross Ton
8 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.
Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 5c. higher.

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$2.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago....$54.80
6-in. and larger, del'd New York... 52.20
6-in. and larger, Birmingham 46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles 69.40
6-in. and larger f.o.b. cars, Seattle. 71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over...	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft....	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads	3.85	..
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	$0.67	$0.85
Fence posts, carloads	.69	.86
Single loop bale ties	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.
†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:
Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. to 1 in.	59	
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland Chicago, New York on lots of 200 lb. or over.

Large Rivets
(½ in. and larger)

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets
(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*	.....	*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.50	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....*$37.34*
Chicago	24.00	23.50	24.50	24.00	*35.46*	.....
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn. fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.63*	26.13	*27.13*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron and Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorous iron; high phosphorous sells for $28.50 at the furnace.

(3) E. & G. Brooke Co. Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21½ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh, 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.00
Lead, 100, 200 & 300 mesh, 11½ to 12½c.	
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum power, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.35
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges. **Mo., Ala., and Tenn. producers—$13.35.

PRICES

REFRACTORIES
(F.o.b. Works)

	Per 1000
Fire Clay Brick	
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00
Chrome Brick	*Per Net Ton*
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton $40.00
Angle splice bars, 100 lb. 2.70

(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00

	Base per l.b.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si	8.90c.	9.05c.	9.55c.
90-95% Si	11.05c.	11.20c.	11.65c.

Spot sales add: .45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb for 80-90% and 90-95% Si.

Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorous or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination for l.c.l. above 2000 lb., packed. Add .25c for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

PRICES

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten. 10,000 lb. of more. .	$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.	
Open Hearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal	$1.50
Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5	$1.10
Ferroboron, contract basis, 17.50% min. Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.	
2000 lb. to carload	$1.20
Under 2000 lb.	1.30
Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload	26c.
Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	87.5c.
No. 6	60c.
No. 79	45c.
Bertram, f.o.b. Niagara Falls	
Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb contained Cb.	
2000 lb. lots	$2.25
Under 2000 lb. lots	$2.30
Ferrotitanium, 40%-45%, f.o.b. 0.10c. max. Niagara Falls, N. Y., ton lots, per lb. contained Ti.	$1.23
Less ton lots	$1.25
Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium	$1.35
Less ton lots	$1.40
High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload	$142.50
Ferrophosphorus, 18% electric or blast furnace, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equaled with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo	80c.
Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales	
Carload lots	14c.
Zirconium, 12-15%, contract basis, lump, f.o.b. plant usual freight allowances, per lb. of alloy	
Carload, bulk	4.6c.
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.75c.
Ton lots	9.25c.

Osborn End Brushes End Bottlenecks

Hard-to-brush parts that formerly caused production lags are easy to burr and clean with Osborn End Brushes

ONE aircraft manufacturer using Osborn End Brushes on a bonding operation does the job in 13% *of the time formerly required.*

A large electrical manufacturer uses Osborn End Brushes to remove burrs from aluminum housings for small electric motors in 20% *of the time formerly required.*

An aircraft ignition company polishes cup-shaped contact receptacles with Osborn End Brushes in 33⅓% *of the time formerly required.*

A landing boat builder uses Osborn End Brushes to clean welds in inaccessible corners, doing the operation in 20% *of the time formerly required.*

Wherever there are tight, awkward, hard-to-get-at places that must be cleaned of weld-scale, burrs, rust or corrosion, use Osborn End Brushes. They operate on all standard power tools, air or electric. *And you'll get higher quality, faster production—at lower cost!*

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue
Cleveland, Ohio

Osborn Brushes

WORLD'S LARGEST MANUFACTURER
OF BRUSHES FOR INDUSTRY